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Municipal Engineering

VOLUME XXI. AUGUST, NINETEEN HUNDRED ONE. NUMBER 2.

SOME NOTES ON ELECTRIC LIGHT AND POWER DISTRIBUTION.

THE ELECTRIC GENERATOR.

By Daniel W. Mead, Consulting Engineer, Chicago, Ill.

The extending use of electricity as a means of energy transmission and distribution for power, light, etc., has made it desirable for the engineer, who may not be an electrician, to be able to intelligently select transmission and distribution plants and the various apparatus to be used in such plants; to lay out and calculate the necessary circuits, and to estimate the energy losses in such systems, in order that such systems may be compared with other means of energy transmission, and in order that systems installed may work without unnecessary loss and in a satisfactory manner.

In view of these facts the following notes and data on the subject are presented. These notes are intended only to give an outline of the subject, and to point out the basis for calculations and estimates.

In any transmission plant the system may be considered to originate with the prime mover or primary source of power, which may be a steam engine, gas engine, water wheel, or any other source of power which may be used in any particular case, and from which the power to be transmitted is derived. It is not the purpose of this paper, however, to treat at length of such motors, or of the means of connecting them with the generators of electric systems. These subjects will be, however, briefly considered in relation to their individual efficiency, and their effect on the efficiency of the entire plant.

The electric generator or dynamo is a machine for the conversion of mechanical power or kinetic energy (that is, energy in the form of motion) into energy in the form of the electric current.

The dynamo is by no means a perfect machine. Like all other converters of energy, it loses by friction and in other ways a portion of the energy which it receives, and converts only a percentage of the same into the electric current.

Nevertheless, the dynamo has reached a point quite as near mechanical perfection as any other machine. Like most other machines, also, the dynamo gives its greatest efficiency when operating at its rated capacity, and loses in efficiency as its load becomes less than the rated load.

Messrs. Crocker and Wheeler, in their work on "The Management of Dynamos and Motors," give "the ordinary values of the various losses in a good dynamo or motor of 25 H. P., or more," as follows:

	Power lost. Per cent.
Used in magnetizing field (1 to 3) average	2
Loss in armature resistance (1 to 3) "	2
Friction in bearings, average	2
Friction in brushes, "	.5
Friction in air, "	.5
Hysterisis in armature core, average	1.5
Foucault currents in armature core, average	1.5
Total losses	10
Useful power developed (output of dynamo)	90
Total input of power	100

At less than full load the losses do not decrease in proportion to the actual power delivered, hence there is an increased proportional loss, or a reduction in efficiency at partial loads.

For the purpose of this paper the principle of generation, or of dynamo design, will not be considered. The essential facts in this connection are the kinds of dynamos which are in use, and the peculiarities which affect their use, and the distribution of the currents which are generated by them.

In general, dynamos, and electric motors also, can be divided into two classes—direct

current machines and alternating current machines.

In the direct current machines, the current is continuous and of one character.

In the alternating current machines, the current is alternately positive and negative, the changes being frequently very rapid, sometimes as high as 7,500 cycles per minute, or more.

The following are the forms of machines in common use and their most important uses:

1. The constant direct current generator, or arc machine, is wound to maintain a constant or uniform current (that is, a current constant in quantity), and usually either of about 6.6 or 9.6 amperes. In this machine the voltage (or pressure) increases in proportion to the resistance in circuit. With this form of generator the resistance must be arranged in series, the current passing in turn through each resistance, although some machines of this class are arranged to take care of two or more circuits.

2. The constant potential direct current machines are arranged to carry a voltage (or pressure) which is to be kept constant at a center of distribution. The voltage of these machines usually varies between certain limits, the maximum being about 110 per cent. of the minimum. In these machines the amperes or quantity of current increases according to the current used for various purposes. These machines are usually wound for:

Minimum Voltage.	Maximum Voltage.
110	125
220	245
500	550

The first two types are used most largely for light and power circuits. The last one is most commonly used for traction purposes, although all are applicable and are used to some extent for each purpose, when properly arranged and under suitable conditions.

With these machines, the resistances, that is, the lights, motors or other apparatus in which the current is utilized or consumed, are connected in parallel between the wires, but, if they are of comparatively low resistance, they may be placed in series until the resistance equals the given voltage; that is, two 110-volt lamps may be run in series between the wires of a 220-volt system, or ten arc lights having a resistance requiring 45 to 47 volts to overcome the resistance in each lamp, can be operated in series between the wires of a 500-volt power circuit.

Commonly, alternating generators are designated as single-phase, monocyclic, two-phase or three-phase. The single-phase generator and distributing system is the simplest and is mainly applicable to lighting systems, and where only a few, if any, motors are used. The greatest objection to the single-phase system for general use has been due to the fact that motors of this type could not be readily started up when carrying their load. This objection is, however, being overcome to a certain extent, as single-phase motors giving satisfactory results are now constructed in sizes up to fifteen and even twenty horse power.

The monocyclic system is a modified single-phase alternating system designed for localities where a certain amount of motor work is desirable. With the advent of successful small single-phase motors its importance is, however, considerably lessened. The monocyclic system is a two-wire system in which a third wire is run from the generator to those points only where motors are used. This wire is termed the teazer wire, and produces the necessary lagging current to start the motor.

The two-phase system is a four-wire system, from which lights can be taken from the wires of either phase. For motor work, however, the four wires from the generator must be run to each motor.

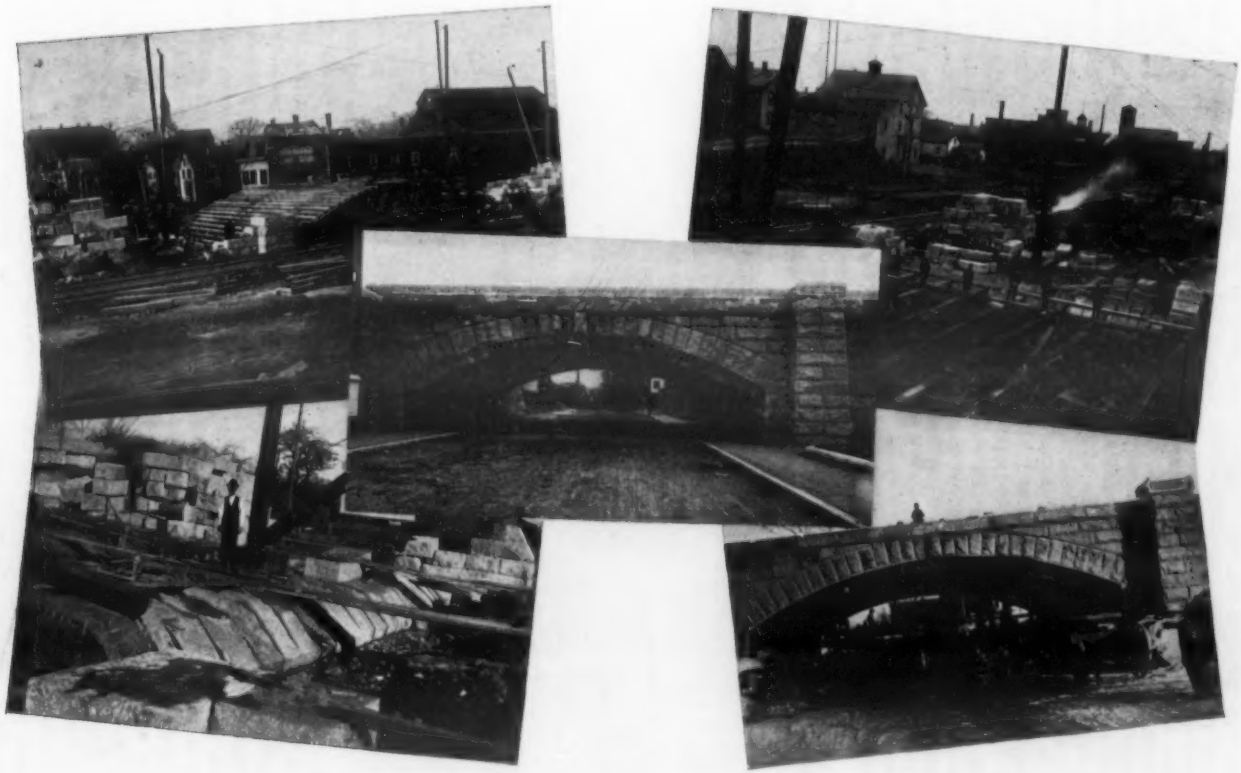
The three-phase system is particularly advantageous for installation where the load consists largely of motors. Its especial advantage is the saving in wire effected by its use over other alternating systems—a matter further considered in later articl s.

Alternating generators are usually designed for from 25 to 125 cycles per second. Below 40 cycles per second, however, they are not found altogether satisfactory for lighting purposes. From 40 to 60 cycles per second are usually considered the most advantageous frequencies for combined power and lighting systems.

For incandescent lighting alone, in cases where no very long transmission of current is necessary, the 125-cycle machine is entirely satisfactory.

For arc lighting with the alternating current, a very successful method consists in the use of what is known as a "constant current transformer," placing the arc lights in series on the same general plan as with the direct current series arc lighting system. For arc lighting from 40 to 60 cycles are preferable, as the lamps are not entirely satisfactory on either higher or lower frequencies.

Since alternating currents appear to seek the outer surface of the wire, the carrying



ARCH OVER COURT STREET, BROCKTON, MASS.
Showing method of construction. N. Y., N. H., & H. R. R.

capacities of wires in alternating practice are not in proportion to their cross sections, as is the case in direct current systems. For this reason smaller wires are more economical, and are usually adopted, especially in the higher frequencies. Other losses due to the nature of the current are also entailed in alternating work.

As far as the generator is concerned, it is well to remember that the lower the number of cycles, the larger the wire that can be used without inductive losses. In a general way, 25 cycles per second may be considered as ideal for power purposes where no lighting is used. The machinery, however, is considerably more expensive than apparatus of higher frequencies. For lighting purposes 60 cycle, single-phase, 2,000-volt machines may be considered the most satisfactory, both from the standpoint of general adaptability and expense.

Alternating generators for lighting purposes are usually wound for 1,040, 2,080 or 3,120 volts at no load and compounded for 10 per cent higher voltage at full load to overcome the drop in the line and transformer, and keep automatically a constant voltage, as nearly as possible, at the lamps.

Alternating motors of 50-horse power and over are often made in voltages that correspond directly to the voltage of the generator by which they are to be operated, but the smaller sizes are usually wound for 110, 220 or 550 volts, and must be operated through transformers, except where generators of similar voltage are used, which, in alternating practice, is of somewhat rare occurrence.

THE ABOLITION OF RAILROAD CROSSINGS AT GRADE.

The growth of our centers of population and the consequent increase in amount and speed of railway traffic is making the question of the abolition of grade crossings of railroads more important each year. In the more thickly populated states, notably Massachusetts and Connecticut, it has become sufficiently important to warrant special legislation upon the subject and the appropriation by the state of money for partial payment of the expense of making the necessary changes.

The city of Cambridge, Massachusetts, is now seriously considering its situation, which is in some respects peculiar in detail, though similar in general to that in other cities. City Engineer L. M. Hastings has recently made a report offering several alternative plans for solving the various problems arising, and making his recommendations.

The case of the Boston and Albany Branch Railroad is quite similar to that of the main east and west lines of the Union Railway Company in Indianapolis, the railroads in Milwaukee and elsewhere, the lowering of street or railroad being limited in amount by the high-water level in bay, lake, or stream. Mr. Hastings presents three plans for making the separation of the grades. His arguments upon them are so clear and so general in their application that they will be valuable aids in the discussion of the question elsewhere. Upon the general questions of the distribution of the responsibility for the present condition and of the cost of the changes he says:

In any abolition of grade crossings there are three parties to be considered whose interests will be directly affected—

First. The railroad company owning or operating the railroad.

Second. The parties or persons, called generally "the public," using the railroad for the transportation of persons or property.

Third. "The public" using the highways for a similar purpose.

It is plain that neither one of the three parties named is entitled to exclusive consideration in deciding on the merits of any proposed plan of separation of grades, but that plan is best which will in the largest degree serve the interests of all three parties, with the least damage and inconvenience to any, for it is equally plain that in nearly every case some of the parties must inevitably be inconvenienced and damaged to some extent. A fair and proper adjustment of these elements is the thing to be striven for.

The amount of use made by the two ways, railway and highway, is also an important element to be considered. It is plain that the convenience and necessity of the large number of persons using the several main thoroughfares of a city—as in the case now being considered, and shown by tables of travel—is entitled to more consideration than if the railroad was crossed by thoroughfares carrying but a small amount of traffic. On the railroad side, on the other hand, as this is not a passenger road, the only thing to be considered is the facility and cost of handling and transporting freight.

The first plan proposes the depression of the tracks to the lowest point at which

drainage can be secured without pumping, and the elevation of the street crossings. This means a lowering of the tracks about two and one-half feet, and a raising of the streets a maximum of eighteen and one-half feet. The cost of this plan is estimated to be $2,082,501. Its advantages and disadvantages are thus stated:

Advantages — First, slight disturbance to railroad and its connections.

Second, slight interruption to railroad traffic during construction of work.

Third, better outlook and more agreeable condition for travelers on the highways. As the highways will at these points be considerably elevated above the general dead level of the lands adjoining, some diversity to the outlook will be given by reason of this increased elevation. It is generally to be so desirable or valuable as it was in its first condition.

Third, increased cost and power required in all highway travel, by reason of the introduction of a rise of about eighteen feet in passing over the railroad. The enormous highway traffic shown by the statements in traffic tables would be obliged to ascend the elevation and descend again for all time to come.

Fourth, increased cost to the city of maintaining the highway bridges over the railroad.

The second plan calls for the lowering of the streets to the grade proposed for the railroad in the first plan, and elevating the railroad a maximum of about fourteen and one-half feet. This plan would cost $807,-

ELIOT STREET ARCH, BROCKTON, MASS.
Forty feet span. Under six tracks. N. Y., N. H., & H. R. R.

more agreeable to pass over a railroad than under one.

Fourth, ease of reaching factories and local business with sidings from the railroad.

Fifth, good grades for railroad and so small cost for hauling freight.

Some of the disadvantages would be— First, its great cost. Owing to the large number of estates affected by the inevitable changes of grade on the highways, the amount which may be expected to be obtained by owners of property will undoubtedly be very large. Some of the most expensive property lies close to the railroad.

Second, the undesirable condition in which property and buildings will be left when the grade is raised. This will probably result in decreased tax valuation. Although large damages may be paid an owner, it often happens that the money is not spent in improving the property, but its value is allowed to decrease. Property situated on an inclined street, with yards and areas many feet below the level of the sidewalk, as much of this would be, would not be likely

902. Its advantages and disadvantages are stated as follows:

Advantages—First, small cost; in the matter of property damages alone, there is a very great saving over Plan No. 1.

Second, good conditions for the highway travel as regards grade. By this plan the long street inclines are avoided.

Third, no care and maintenance of highway bridges.

Fourth, very slight depreciation of property affected by alterations of grades of highways.

Fifth, good drainage for the railroad.

Sixth, ease in keeping track clear in winter.

Disadvantages—First, heavy grades on railroad necessitating increased consumption of coal in moving trains.

Second, inconvenience to railroad in reaching yards and sidings.

Third, increased cost to railroad of maintaining bridges over highways.

Fourth, unsightly construction of the railroad. There will not be height enough

to treat the bridges or embankments with much regard to artistic effect.

Fifth, unpleasant conditions to highway travel passing under the railroad bridge.

The third plan proposes the depression of the tracks six feet below the elevation proposed in the first plan. The tracks must in this case be protected from the inflow of high tides, and storage for any water entering at such times, or pumping capacity to discharge it as it enters must be provided. The plan proposed includes a moderate-sized reservoir to retain the ordinary drainage of the land and average rainfalls until it can be discharged at low water, and pumps operated by electricity, gas or gasoline, in duplicate, of sufficient size to take care of any excess of rainfall over the storage capacity, the operation of such pumps being only occasional. The cost of this plan is estimated at $1,404,482, including $56,411 for the drainage system. The advantages and disadvantages are summarized as follows:

By this plan the burdens and disadvantages of both No. 1 and No. 2 are more evenly distributed, the highways having a moderate elevation and the railroad a moderate depression. The results from an aesthetic standpoint will be decidedly better; the unsightliness of the railroad and its traffic being largely hidden in the depression so as not to be obtrusive, and the highways having all the advantage of an overhead crossing.

A decided improvement, also, is made in the matter of depreciated property. As the maximum elevation of the highways is by this plan twelve feet instead of eighteen feet by Plan No. 1, property affected will be left in better condition.

One disadvantage to the railroad which may be thought to be occasioned by this plan would be possibly difficult or defective drainage, due to the low elevation of the tracks. It should be remembered that this is the same elevation as that of a portion of the main line already referred to, now being successfully operated in Boston. With the provisions made for contingencies at the pumping station, and by the exercise of proper care, no difficulty need be experienced in this matter.

Another disadvantage which may be urged is the difficulty in keeping the tracks clean in a depression in winter. While undoubtedly it will not be so easy to keep the tracks clear under these conditions as if on a fill or embankment, it will require nothing more than the ordinary appliances of a well equipped road to accomplish good results. The condition in this case will be quite similar to that on the depressed portions of the Boston and Albany Railroad in Newton, and the Pennsylvania Avenue Subway, in Philadelphia, as shown by cut in next column.

Similar plans, less extensive, are proposed for other crossings in the city.

The city of Brockton, Massachusetts, has done much work in the elevation of tracks through the New York, New Haven and Hartford Railroad. We are indebted to J. W. Rollins, Jr., now of Holbrook, Cabot & Daly, Boston, who was assistant engineer of construction for the company, for a number of photographs of the work, descriptions and statements of cost.

The railroad company decided upon the large use of brick arches, with highly ornamental stone facings, as more satisfactory from an architectural point of view, and no more expensive than plate girders for the same service. The group of pictures of the Court street arch, on page 59, shows the general plan of construction. The arches really spring from the street level, as will be seen from the position of the centering in the upper left hand picture and the position of the skewbacks as shown in the lower left hand and the upper right hand pictures. The foundation and backing of these skew-

PENNSYLVANIA AVENUE SUBWAY, PHILADELPHIA.

backs is of concrete, the pressure being distributed through two additional layers of granite. They are located some feet back of the street line, the face of the arch being built out to the street line so as to show a vertical wall about seven feet high next the sidewalk. This construction saves considerable masonry in the backing. The arch proper is built of brick and each end is faced with stone masonry, usually granite. The wing walls are also of stone.

The pictures on pages 61, 63 and 64 show the various modifications of the general plan for the local requirements. The Eliot street arch is exceptional, in being all of granite except some concrete in backing. The School street arch is notable as being on an angle of thirty-three degrees with the perpendicular to the direction of the street. This heavy "skew" is often considered un-

safe by theorists, but this arch has thus far carried its load without complaint.

A semi-circular arch is shown on page 65. It is under nine tracks in the freight yard. Aside from its form it is similar in construction to the others.

On page 66 is shown one of the stairways to the elevated station and an inside view of the method of construction of the granite face of the arch to give the seven-foot vertical wall at the sidewalk line.

On page 67 a steel arch at Forest Hills, of the same span and rise as the Court street stone and brick arch, is shown. This steel arch cost $34,000, the Court street arch cost $29,000, and the Center street arch, of similar construction, cost $32,000. Both the masonry arches had expensive towers and stairways, and the steel in the former arch cost about two and one-half cents a pound, having been purchased when prices of structural metals were lowest.

Two other masonry arches built by the railroad are shown as examples of other methods of treating the architectural features. The large arch on page 67 is over the Parkway at Forest Hills, and the other is over Milton street in Readville. Its similarity to the Brockton arches with the "buttress faces" omitted will be noted.

The use of concrete for such arches is rapidly increasing, and still further reduction in cost may be expected. The material to be used in any particular place must, however, be determined on study of the local requirements and the relative cost of the various materials laid down on the site of the arch.

SCHOOL STREET ARCH, BROCKTON, MASS.
Skew arch. N. Y., N. H., & H. R. R.

REGULATIONS FOR USE OF WATER IN SMALL PLANTS.

A correspondent asks a number of questions regarding the management of a small water-works plant which can perhaps be answered most satisfactorily in the form of a general article, with references to sources of more detailed information on points where it is desired. The plant in question has pumps with a capacity of 4,500,000 and a daily pumpage of less than 1,000,000 gallons, for less than 800 taps. The cost of coal is $2,300, of supervision and engineers about $2,000, and repairs $250 a year. It would seem that the cost of coal is very reasonable for the quantity of water pumped, but that the consumption of water is excessive for the population served, or for the population of the town, about 4,000.

The questions of most importance to the management at present are: how to prevent waste, when and how long to use hose for sprinkling, and how to reduce unnecessary consumption and waste with as little complaint as possible from consumers.

These are questions which can not be answered for definite application to a particular locality, without full knowledge of the local conditions and the character and habits of the people. A few general principles

may be suggested, the details of the application of which must be left to the good judgment of the water commissioners and superintendent.

It should be observed, to begin with, that the selection of water commissioners should be removed as far as possible from the election booth and placed where there is the most expectation that competent persons may be appointed. Their tenure of office should be long, say three to five years, and not more than one should be selected each year. The appointment of water commissioners by the judges of the local courts seems to work excellently in Erie, Pa. In a small plant a member of the board may act as superintendent, with some salary in consequence of his additional duties, the other members serving without pay. An appointed superintendent would need to combine some additional municipal or other duties with those of superintendent, if the greatest economy is desired, or he must perform some duties not usually expected of that official.

The question of waste prevention is practically so complicated with that of the methods of assessing and collecting rates that they must be discussed together in some of their phases. If meters are in use the question of water waste takes care of itself. Each customer is at liberty to waste all he is willing to pay for, and if the rates have been fixed properly he will be the only loser. The water department must then look out for the excess of pumpage over consumption, locating and repairing leaks in mains and public connections which waste undue amounts of water.

If meters are not in general use, several courses of procedure are open. The first one usually suggested is the introduction of meters, and in many cases this is the proper one, practically as well as theoretically. It is undoubtedly true, however, that occasionally a few large users or wasters of water being placed on meters as exceptional cases, the remainder of the consumption is within reasonable limits, and the saving in cost of pumpage by metering all services is too small to pay the expense of installing the meters, reading and maintaining them. This may easily be the case in the present instance. The only saving probable upon a reduction of consumption here is in the amount of coal used. This will not be proportional to the reduction in pumpage, for, either the pump must be shut down, and kept in readiness for use at any moment, or it must be run at a rate farther below its economical rate than at present, so that it will use more coal per million gallons pumped than at present. When the consumption approaches the limit of the capacity of the smallest pump in the plant, this argument will have much less force

CENTRE STREET ARCH, BROCKTON, MASS.
N. Y., N. H., & H. R. R.

than at present. It is very doubtful, therefore, whether the saving in coal would pay the cost of reading and maintaining meters. Close study of the exact actual conditions would be necessary to determine this point definitely. It will be possible to reduce the cost of pumping quite materially by making a close inspection of the system and stopping waste where found, and to add something to the income by putting meters on the connections of some large users whose cases are not covered by the regular schedule and who are now paying at too low a rate for the quantity of water they are using.

SEMICIRCULAR ARCH, BROCKTON, MASS.
Thirty feet span. Under nine tracks. N. Y., N. H., & H. R. R.

Waste may usually be stopped by a simple notice. The following form is in successful use in Erie, Pa.:

Your attention is called to the following rules of the water department:

"1. Water takers must not permit their pipes or fixtures to remain in a leaky condition, or waste the city water otherwise, or allow it to be wasted.

"2. Every stop and waste must be readily acessible to the party for whose use it is designed, easy of operation, and provided with a key approved by the department, which shall either be attached to the stop or kept in a place where it will be convenient for use.

"3. Water takers must keep their pipes and fixtures in good repair and protected from frost at their own expense, and will be held responsible for any waste or damage that may ensue from defective pipes and fixtures.

"4. For each and every violation of the by-laws, rules and regulations of the water department, the offending party shall, on conviction, be fined not less than five nor more than fifty dollars for the use of said department. The water commissioners may, also, at their option, turn off the water from the premises of the party."

On inspection of premises No. —, ——— street, occupied by ———, it is found that ———. My instructions require me to notify you to have the same placed in proper condition on or before ——— next, at which time another inspection of the premises will be made. ———, Inspector.

The character of the provisions of the ordinance quoted in the notice will vary according to local needs and opinions. The board of water commissioners should have the privilege of recommending the rules, the council or town board of trustees putting them into the form of an ordinance without power to alter or add, but having power to strike out provisions they consider undesirable. Inspections of premises must be provided for by ordinance and should be made at irregular intervals at least once a year and whenever waste, willfully or by leakage, is suspected.

A similar notice giving the ordinance provisions regarding sprinkling with hose, marking those, the violation of which has been observed, should have a similar salutary effect. The Erie notice is as follows:

Your attention is called to the following extract from the rules and regulations of the commissioners of water-works, in the city of Erie:

SPRINKLING WITH HOSE.

"28. Assessments for the use of hose for sprink-

ling shall be based upon the territory that will probably be sprinkled, under such regulations as the commissioners of water-works shall adopt; but no charge for sprinkling shall be less, for any separately occupied premises, than three ($3) dollars per season. The sprinkling season is from May 1st to November 1st in each year. There is no fractional part of a sprinkling season. It will cost as much to sprinkle but once at any time during the sprinkling season as it will to sprinkle each day at the prescribed hour, during the entire sprinkling season.

"29. The inside diameter of hose used for sprinkling purposes must not be more than three-quarters of an inch, and the inside diameter of the orifice to the nozzle of the same must not be more than one-quarter of an inch. The use of leaky or defective hose is prohibited.

"30. No apparatus for street or lawn sprinkling shall be used except between the hours of 5 and 8 A. M., 12 and 1 P. M., and 5 and 8 P. M., nor during said intervals more than one hour at a time. Parties who exceed one hour may be charged at fountain rates, or held liable for violation of the rules, at the option of the commissioners of water-works.

"33. Hose shall not be used for cleaning streets or street gutters, for washing away collections of leaves, heaps of dirt or offal, for flooding the streets nor in any wasteful manner otherwise.

"34. No person will be allowed to sprinkle adjoining or opposite premises, nor use the water from any hose attachment or through any hose for any purpose not authorized by the commissioners of water-works. All sprinkling devices not held in the hand when used, shall be classed as fountains or fountain jets, and assessed accordingly.

PENALTY.

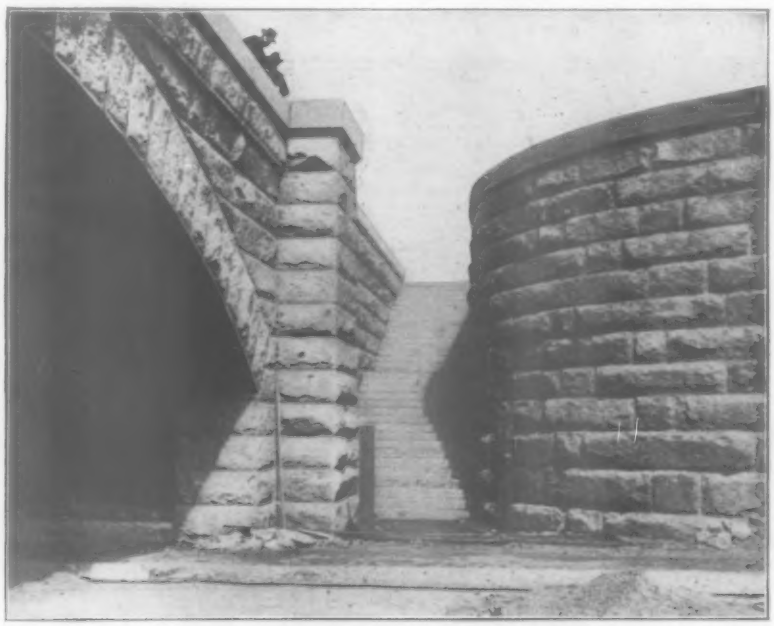
"64. For each and every violation of the rules and regulations of the commissioners of water-works, the offending party will be subject to a fine of not less than five nor more than fifty dollars."

By order of the commissioners of water-works, in the city of Erie.

WM. HIMROD, Secretary.

Your attention is called to the rule or rules marked with pencil.

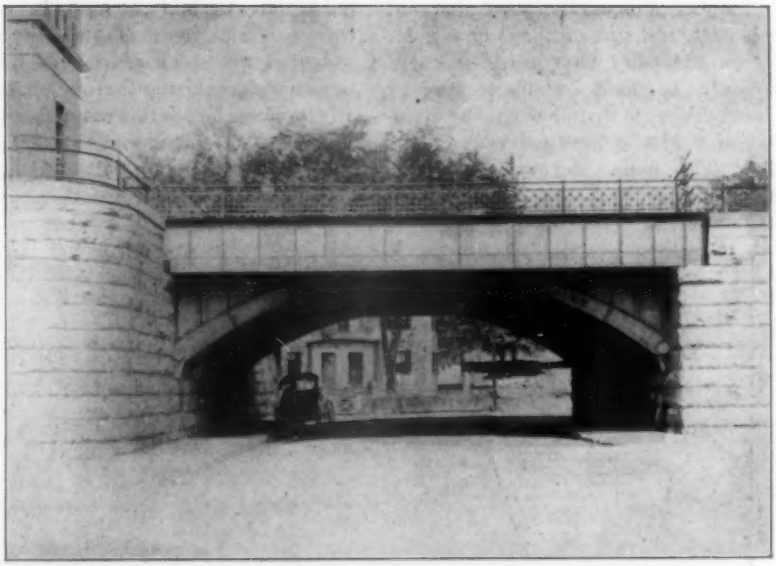
In fixing the ordinance provisions regarding use of hose, the needs of the lawns and streets must be considered as well as the limitations of the water supply. It is quite possible that regulations as strict as those given above are not necessary. It is always a question whether the regulations should be made as strict as might be necessary under any possible conditions, enforcing them only so far as seems desirable until the necessity for strict compliance arises, or whether regulations that should and will be enforced should be made, additional restrictions being applied by amendments to the ordinance as occasion demands. The former is perhaps the more general practice.



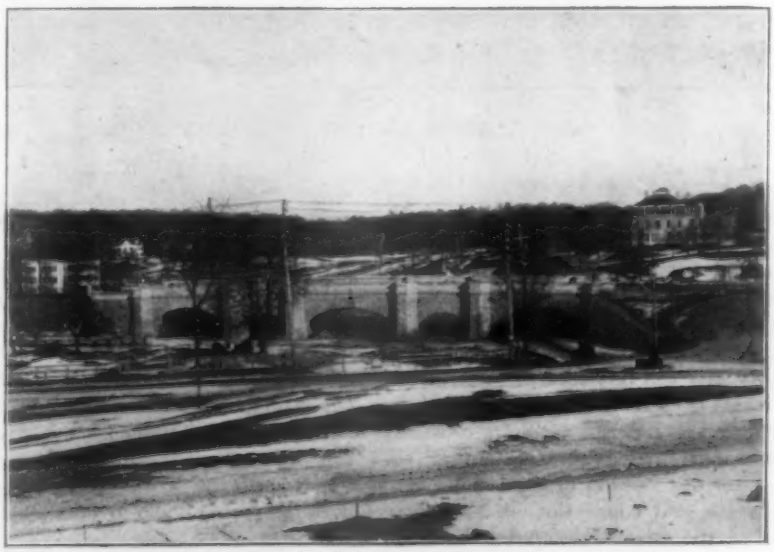
STAIRWAY TO ELEVATED STATION, BROCKTON, MASS.
N. Y., N. H., & H. R. R.

Impersonal notices, delivered at the door or sent by mail, are less offensive, usually, than notifications by a city policeman or other official. The cry of favoritism is sure to arise and care must be taken that it has no basis in fact.

As to collection of bills, the usual process is a notice at regular intervals—say, quarterly—giving the fixtures for which charge is made, and the total amount due. Failure to pay by a fixed date stated in the notice should bring promptly a delinquent notice.



STEEL ARCH OVER HIGHWAY, FOREST HILLS, MASS.
N. Y., N. H., & H. R. R.



ARCH OVER PARKWAY, FOREST HILLS, MASS.
N. Y., N. H., & H. R. R.

In large systems the city ordinances provide the right to turn off the water within a certain number of days after the delinquent notice is sent, and an additional charge for turning on the water when the delinquent bill is paid. In small systems it may be considered desirable to follow up the delinquent notice with a personal visit of the collector. The main objection to this is that many people form the habit of waiting for the appearance of the collector, so that the expense of sending notices is almost useless. If the ordinance authorizing turning off the water at the end of, say, 30 or 40 days from the date of the first bill is enforced, the habit of paying bills promptly will very soon be formed. In Erie, which is used as the example throughout this article, a dozen accounts or so out of thousands may require attention six weeks after the first day of the quarter.

The pipes and connections of the water system in the streets and public grounds and buildings, require quite as careful inspection as private property. Leaks are liable to occur, and the waste in public fixtures of various sorts is often very great.

A very important provision for small systems is that requiring thorough inspection of all plumbing before it is covered up, or some method of licensing and bonding plumbers which will insure that the local plumbers, and especially those from other cities doing work in town, are fully competent and do honest work.

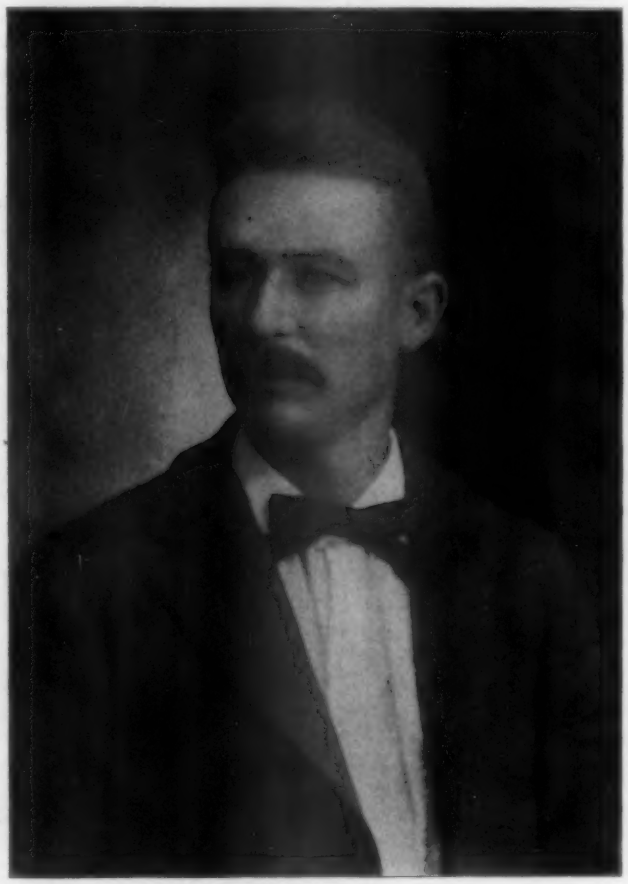
MILTON STREET ARCH, READVILLE, MASS.
N. Y., N. H., & H. R. R.

Goodell's "Water-works for Small Cities and Towns" has a valuable chapter or two on the management of small systems of water-works. The "American Water-works Standard Book-keeping System" furnishes books for keeping accounts, cards for records and notices, etc., which are based on correct principles of management and give direction to all the work of the department, both in operation and in maintenance.

THE INTERURBAN RAILWAY LOOP AT COLUMBUS, O.

Columbus, O., is rapidly becoming a great electric railway center. Lines are projected, built, or in course of construction, which reach from the capital of Ohio to all parts of the state. Most of these are of standard gauge, while the city street railway system is of a broader gauge. It became necessary to provide some means of bringing the interurbans into the city, and the loop was devised. This loop is one and a half miles long and circles the heart of the city. Interurban cars from any direction can pass upon this belt, run around it and start out on the return trip. It is a model of electrical railway engineering, constructed with the least possible expenditure of money for the work done. Its route is in Rich street, Third street, Gay street, Water street and Scioto street back to Rich.

Like most great improvements of the kind, it met difficulties in the way of opposition and injunctions in the courts. With injunction suits threatened and every need of haste in the matter of construction, the Columbus, London and Springfield company, which built it, gave the contract to William H. Luchtenberg, who has made and maintained a reputation for quick and thorough work. Mr. Luchtenberg had trained workingmen, and thoroughly organized the work, and, in order to get a start ahead of the injunctions, began work at midnight, August 19, 1900, with 619 men and a corresponding number of teams. The



WM. H. LUCHTENBERG.

men were divided into twelve gangs, and these gangs were started at work at twelve different points along the route of the loop, so that, when the sun rose Sunday morning the work had progressed so far as to make it inadvisable to attempt to tie-up the improvement with an injunction. The pavements in the railway space were all removed and the blocks were lying beside the curbing. There were injunctions later, but they were disposed of quickly in the courts, and the construction was completed with remarkable rapidity.

The method of construction of the loop was as follows: The width of the trench, eight feet, was first marked out. The bricks or paving blocks were then removed, piled neatly along the curbing so as to obstruct the street as little as possible, and then cleaned and piled on the sidewalk. The stone ballast used for foundation under the old paving was plowed up and hauled to other parts of the city to be used under and between the ties on streets where there is no paving. Then the earth was taken out down to the subgrade, which is 21 inches below the top of the pavement.

This done, the subgrade was thoroughly rammed with heavy iron rammers in order that there might be left underneath the pavement no soft or mucky soil to weaken the pavement.

The ties were then put into place. Only the best of sawed white oak ties, seven feet long, six inches deep and eight inches wide, were used. They were laid so that from center to center the distance was two feet. They rested on the prepared subgrade. The rails were then laid upon and spiked to the ties to the standard gauge, 4 feet 8½ inches wide. They were so laid that the joints were suspended between the ties, and no two joints were closer together than half the length of the rail. The rail used is known as the Trilby grooved rail, nine inches high, 60 and 62 feet long, and weighing 107 pounds to the yard. Each joint between the rails was double bonded with heavy protected bonds, placed under the splice bars. After the rails were spiked to the ties and properly bonded, the ties and track were raised by means of track jacks to the height of the pavement and paving brick were placed under the ends of every third rail. The track was then brought exactly to the grade by using oak wedges on top of the blocks under the rails. By doing this six inches of room was left for laying concrete underneath the ties.

In making and placing the concrete the utmost care was taken. There were put upon the concrete boards two parts of clean, sharp lake sand, one part natural cement, and they were mixed thoroughly while dry. Then there was added sufficient water to make a good stiff mortar. Four parts of clean crushed gravel or rock were dumped into the mortar, and the whole was thoroughly turned with shovels by hand. After being thoroughly mixed, the concrete was taken off the boards and shoved and tamped under the ties, six inches deep for the roadbed. Two concrete boards were used, so that there should be no loss of time. While part of the gang were taking off of one board, another batch was being prepared on the other board. Wheelbarrows were used in measuring quantities. When Portland cement is used, the mixture is one part cement, two parts sand, and six parts stone. The next step was to fill in six inches of concrete between the ties and between the ends of the ties and the outer sides of the trench. This was done in the same manner as putting the concrete beneath the ties, and the whole was tamped until a surplus of mortar appeared above the stones.

This still left nine inches, the height of the rail, to fill. If a paving brick was used on the street, the brick itself took up four inches and the sand for the bed one inch, so four inches of concrete was placed on top of the ties in the same manner as before. When granite block was encountered, the contractor allowed for the difference of depth in the last layer of concrete. The laying of this last layer brought the work up to the sand bed and paving. For filling the space between the rail and the paving blocks some contractors use a mortar of cement and sand. The objection to this is that it is almost impossible to get it stiff enough to make it stand alone. Some use oak boards dipped in tar, but these rot in time. In this case a mixture of good plastic clay and cement—about two-thirds clay and one-third cement—was used. Mr. Luchtenberg has used this method about five years and finds it to answer the purpose. To make the sand bed between the rails the contractor used a frame form conforming to the crown of the paving and resting upon the tracks, which was

INTERURBAN RAILWAY LOOP, COLUMBUS, OHIO.
View at Scioto and Town Sts., terminus of Columbus, London and Springfield Railway.

pulled over the sand bed. This he finds the most uniform and the cheapest way of making a bed between the tracks. The bed on the outside of the track was made by hand. The bricks or paving blocks were then laid and thoroughly rammed by using hand-rammers on a flattener. A coat of clean fine lake sand was spread on top of the brick and allowed to dry and then broomed in so as to fill about one-fourth of the joints between the brick or blocks. This prevents the tar from going down through the sand in the bed and deserting the joints between the blocks. Lake sand will hold the tar and form a bed for it to lie on, while, if coarse sand is used, the tar goes through it and is lost. On brick streets tar was poured on from coal buckets and broomed into the joints. The tar is generally poured at a temperature of 300 degrees Fahrenheit. Sand was then spread on top of the tar. The road-bed thus made is very rigid and substantial. The track is in fact laid in a solid bed of concrete. The standard thus established was recommended by Julian Griggs, chief engineer of Columbus, and adopted by the city authorities for all paved streets just as it was first used on the interurban loop.

On unimproved streets a 70-pound rail was used, with six inches of coarse gravel and sand underneath the ties, between the ties and up to the top of the rail. The curves at the street corners were made on radii of fifty and sixty feet, making them very easy. The first cars that passed over the loop had no trouble and everything was found working smoothly and satisfactorily. In the first construction tie-rods were used to connect the rails, on account of their height, but as the work progressed, it was found better to eliminate them, as the bed of solid concrete held the rails firmly. The railway companies are required to pay for all paving between rails and one foot outside of rail, and pay for sweeping and sprinkling in the same proportion.

Mr. Luchtenberg has added to his reputation by the work on this loop. He is now constructing the Scioto Valley Traction Company's line, from Columbus to Lancaster; the Columbus, Newark and Buckeye Lake Company's line, in Columbus, and the Urbana, Mechanicsburg and Columbus Railway. He is also doing a great deal of the reconstruction work of the Columbus Railway Company's city system and finished for that company its South Parsons avenue extension. We are indebted to him for the information in this article and for the picture showing the work in progress at the corner of Scioto and Town streets, the terminus of the Columbus, London and Springfield Railway, the owners of which constructed the loop.

EDITORIAL COMMENT.

Steam and Electric Roads.

The effect of interurban electric roads upon steam railroad traffic and that upon urban and suburban population are questions of great interest. There seems in some quarters to be a tendency to contest between the two methods of transportation. So far as this reduces local rates of transportation it seems to be a present good, but some of the evil consequences of too sharp competition will appear later.

In the present stage of development of the methods of distribution of electrical energy, the use of steam for long-distance travel is not seriously endangered by the trolley lines. The latter are able to carry a certain amount of such through travel by a great reduction in rates and as a matter of curiosity. The latter reason will soon disappear and the former will not long be of importance. A short study of the situation shows that the ideal system, from the standpoint of the convenience of patrons as well as from that of stockholders, is a combination of the two, the trolley lines taking care of the local traffic and the steam cars picking up the through passengers at given points for more rapid transportation between these centers.

Such a combination will act in two ways. The tendency of the population to move out along the trolley lines is already indicated. This will make more frequent stops of cars necessary, and the trolley line, trying to serve both classes of traffic, must have from two to four tracks, one set for rapid transit cars making few stops, and one set for local cars with transfers to the express cars at their stopping points, according to the sys-

tem now in use on some railroads with heavy local and also heavy through traffic. The development from the local stopping points of steam railroads is limited by the local transportation facilities, that along the trolley line is extended over a wide belt on each side of the line. A combination of the steam and electric systems under one management will, therefore, tend to extend the distribution of population over greater areas, and thus largely increase the local traffic, and can be made to reduce the number of stops on the steam roads, thus increasing the speed of travel materially, while, at the same time, the amount of travel between the stations remaining is largely increased. The trolley thus develops a large new local business, and also increases the amount of travel and the length of haul on the steam railroad, at the same time adding to its revenue and diminishing its expenses and its difficulties.

A contest between the two systems is poor economy from the standpoint of the people as well as from that of the treasuries of the companies, provided the fare-charging powers of the roads are properly regulated. The steam railroad on the one hand is developing its local traffic at great disadvantage, and even interference with the longer distance travel. The electric road, on the other hand, can not now give full satisfaction to through travel, even if it neglects to some extent the development of the local travel. The people must endure these inconveniences in case of contest. The companies must suffer from excessive ratio of expenses to receipts and also from delay in the development of the business.

The economic value of combination being so great, its consummation can hardly be long delayed. Some money will doubtless be wasted in a large number of individual cases in constructions on competitive lines, and some disadvantages will long be suffered where the conveniences of the combined systems are not considered during construction, but co-operation of the two systems is bound to come, if actual combination of operating companies does not result.

The questions of values of franchises and of regulation of fares will then arise. The state, the county, the city and the town are interested in these questions, and the state, as the central authority, should take them up and settle them in an equitable manner which shall guard the rights of the people, before the vested rights of the corporations, procured without proper restriction, become strong enough to complicate the solution of the problems.

Uniformity in Municipal Accounting.

Progress toward definite formulation of recommendations by societies having influence is apparent. Whatever effect such societies may have promises, therefore, to begin within a reasonable time. The committees of societies meeting during the summer are moving slowly and the effort to get together is so far rather weak, but is constant. The next society to consider the question is the American Society of Municipal Improvements, which meets at Niagara Falls, October 1–4. The editor of this magazine is the chairman of the committee having the subject in charge, and he asks for all the assistance and encouragement which those interested in the subject can offer in the preparation of his report.

In addition to the reports of committees referred to, it may be well to state the nature of the practical attempts to procure uniformity which have been put in operation to any appreciable extent. They are very few in number and are entirely independent of each other, so that further consolidation is needed to bring about true uniformity.

The first and oldest is the form for summaries of water-works reports which was prepared some years ago by the New England Water-works Association, and is used by a few superintendents. It is a valuable guide as far as it goes, and should serve as the center for the finally adopted forms for such reports, if any such adoptions are made. It needs some extensions to cover some portions of the water-works field not now touched.

The second is the American Water-Works Standard Bookkeeping System, which is an attempt on the commercial side to introduce uniformity in water-works accounts by making standard books upon a plan devised from a study of the best forms of bookkeeping and record-keeping in vogue in the smaller water-works offices. The making of the reports called for by the form first mentioned is easy if this system of books is in use. A number of works are already sup-

plied with the books and their use is extending.

The third and latest is a blank book furnished at a low cost by the League of California Municipalities, ruled for convenient use to segregate department accounts in a municipality. The headings of the columns are left blank, those needed for each city being written in. Standard entries are suggested if desired. One book may be used for a city, each department using as many pages as it needs, or each department may have a separate book. The object is to give forms for the guidance of city officers in making their reports, so that the information given in them will have its full value. If standard forms are finally recommended, similar books with the headings printed in may be furnished, which will be of still greater value than the blank form. These forms cover all the municipal activities, while the two first mentioned are restricted to parts of a single department.

Information concerning any other plans for reducing any class of municipal accounts to uniformity is requested, that the next report of the committee may be as complete a statement of the progress made as is possible.

State Regulation of Engineering Practice.

One of the prominent topics for discussion at the recent meeting of the American Society of Civil Engineers was the regulation of the engineering profession by statute. The extent of the discussion which was held indicates fuller recognition of the importance of the subject in this society. Earlier attempts at discussion, which have been made at the annual meetings in January, and also at monthly meetings, have met with failure, perhaps on account of the manner in which the question was introduced, being smothered at once by the character of the speeches made by prominent members. Mr. Whinery has long been interested in the question and may have been responsible for the favorable position which it had on the convention program. He certainly is responsible for a clear and logical statement of the conditions and one class of remedies for them. His propositions are conservative, practicable, and not extremely difficult of application. That it is a subject for state rather than national legislation is unfortunate, but is a condition which can not be modified, both on account of our form of government, and on account of the varying legal requirements, methods, and habits of the various states.

Those engineers who think the business men who direct and prosecute undertakings requiring engineering skill of high order are not likely to be deceived to any great extent by a shyster engineer, are thinking of the small number of such men with whom they come in contact. They do not know, or have forgotten, the thousands of men working on smaller projects and the many other thousands who have temporary charge of public works as councilmen and other city officers, elected or appointed, who are not fitted by education, experience, or direct personal interest to judge of the technical abilities of an engineer. These men are too often led by personal preferences, recommendations of equally incompetent judges among their political friends and patrons, and much too often by financial interests opposed to the honest and efficient conduct of public improvements. The speaker who thinks the ordinary citizen is more competent to judge the qualifications of an engineer than of a physician, has surely been misled by the apparently rapid development of engineering knowledge and training in almost any one who finds himself in a position which seems to require such knowledge and training. He seldom assumes a knowledge of medicine, even if appointed one of the directors or trustees of a hospital, but if on a water-works committee he becomes fully competent to decide the minutest details of power and distribution plans. Fortunately money misspent can be replaced by new taxes, so that these assumptions are not so fatal as similar ones by the hospital trustee might be. But life may be lost in a great fire, uncontrolled because the sizes of pipe in the distribution system have been cut down by order of this same committeeman.

It is scarcely to be doubted that the people interested in the expenditure of the proceeds of municipal taxes will ultimately defend themselves from the incompetent engineer as well as the incompetent committeeman by legislation which will put the control of technical details into the hands of men shown by examination and experi-

ence to be competent to direct them with a reasonable approach to correct principles. Shall the engineers let the direction of the movement slip by them, or shall they give it the benefit of their expert knowledge, and thus save some of the expensive experiments in the development of a proper system which will undoubtedly be made by inexperienced, well-meaning persons who see and try to remedy the conditions without sufficient knowledge of the technical details to offer in the beginning a complete practical solution?

The following editorial in a recent number of the *Surveyor and County Engineer* shows that the question is as important in England as here:

For two weeks past a discussion has been going on in our columns as to the necessity of some control being exercised by the local government board over the appointment of engineers and surveyors to local authorities, in order to secure (1) the appointment of properly qualified men, and (2) their satisfactory treatment when they are appointed. As regards the first of these points, it so happens that just at the moment a significant illustration comes to hand of what is possible under the present state of affairs. On Tuesday, April 6, the Great Harwood urban district council had occasion to consider in committee the appointment of a surveyor and inspector. We understand that there were nearly fifty applications, most of them from candidates who have been trained to the particular duties required. According to a local paper the first step taken was to strike out the names of all candidates who asked for more than £150 per annum. The remaining names were further reduced, and finally the council in committee decided to appoint, at a salary of £130—a local solicitor's clerk! We understand that the condition of the district is such that the services of a trained and thoroughly competent surveyor are very badly needed. The appointment, however, has to be confirmed by the council in open meeting, so that there is still time for the majority to repent and thus avoid a gross scandal, to say nothing of the injustice to the numerous candidates who have been put to trouble and expense by the advertising of the appointment. A man would probably hesitate to embark in trade as a butcher, a baker, or a candlestick maker, if he did not know the business, but every untrained, inexperienced and egotistical impostor seems to consider himself perfectly qualified to carry out the duties of surveyor to a local authority.

The following from a paper on the subject in the same journal offers one solution, which might be possible for our states also, being possibly more practicable than the state supervision of municipal improvements which has been suggested:

That some form of protection for the surveyor is essential can hardly be doubted, and in the face of multiplying instances of jobbery in appointments, the necessity for the protection of the rate-paying public can also hardly be doubtful. Under these circumstances it appears that if government would make the office a branch of the public service, considerable all-round benefit would accrue, and the status of the official would be raised. He would almost certainly be required to enter his profession by an examination, and would be able to do his duty without fear or favor; small districts would probably be grouped, one man placed in charge, and a minimum salary and scale for superannuation fixed at a figure which would enable a surveyor to meet his foreman bricklayer without experiencing a sense of overwhelming financial inequality. Appointment and promotion would be managed with system, and the disadvantages attaching to the constant shuffle-up of the municipal cards would be to a great extent neutralized.

Does the public stand to gain anything from such an alteration? There can be but one answer. The more impartial, better educated and more scientific the surveyor, the better value the rate-payers will get for their money. The strides of sanitary science now call for mental training of the highest type. The wide-embracing municipal profession, if placed on a proper basis, would be one of the most attractive branches of engineering. At present it is "cribbed, cabined and confined" by the initial conditions of its existence; under a continuance of present circumstances it is hard to see how matters are to change for the better. Is it within the range of practical politics to upset those initial conditions?

Width of Paved Streets.

Mr. Rosewater's recommendation in his annual report that the width of streets be cut down to 24 feet, or even less when traffic is light, has led to some discussion of the saving in expense of first construction, and there is a general agreement with the stand which he takes. Many particular examples of the economy in first cost may be cited. The city of Terre Haute happens to furnish information easy to put in shape.

The practice, with few exceptions, seems to be to make asphalt streets 36 feet wide and brick streets 41 feet wide. Omitting the streets which are partly occupied by street car tracks a table can be made as follows, giving the saving in area of pavement,

assuming all the streets reduced to 24 feet width:

Street.	Length.	Material.	Present Width.	Saving Sq. yds.
Ohio	400	Asphalt	53.54	1,313
Ohio	2,800	"	49.54	7,946
Tippecanoe	1,150	Brick	30.	767
2d	600	"	57.54	1,569
3d	600	"	63.	2,600
4th	2,820	"	38.	2,820
4th	1,260	"	41.	2,380
5th	600	"	41.	1,133
5th	5,100	Asphalt	33.	5,100
5th	365	"	36.	487
6th	5,520	Brick	36.	7,360
7th	2,800	Asphalt	36.	3,733
7th	1,035	"	41.	1,955
8th	600	Brick	41.	1,133
Total saving				40,296

The average cost of the wearing surface of the pavements, without reference to whether they are brick or asphalt, is $2.14 a square yard, and this may be assumed as the saving per square yard. The saving in brick surface is about 2 per cent. greater in area than the saving in asphalt surface. This gives the saving in cost of pavements, by reducing the width to 24 feet, as $86,233, more than 25 per cent. of the total cost of the wearing surface of the pavements. This could be increased somewhat by taking closer account of the savings at street intersections.

The saving in repairs will not be proportional to the reduction in area, for the concentration of traffic upon narrower runs will increase the percentage of wear somewhat and make repairs more frequently necessary, or perhaps require renewal at an earlier day.

Another important line in which saving will be made is in sweeping and sprinkling. This saving can easily be computed for any specified price and manner of sweeping and sprinkling. It is an annual reduction in tax for such purpose and might be capitalized for comparison with the saving in the first cost of pavement.

That all the streets can be reduced to a width of twenty-four feet happens to be a very violent assumption for Terre Haute, but very few hundred feet of the streets in the list could not be reduced in width somewhat, and the violence of the assumption calls attention to the other side of the question, which seems liable to be forgotten. There are a good many inconveniences about narrow streets which can not be overcome. In some cases of short streets of little traffic and no standing of vehicles at the curb, the advantages of narrow streets far outweigh the disadvantages. If a street is devoted to business, ample room must be left for standing vehicles and passing traffic. If it is developing rapidly and shows a tendency to change its character, the tendency must be taken into account, and width must be given at the expense of greater first cost, repair and maintenance. If the blocks are long the gradients are steep, the cross streets are narrow, the balance will turn toward streets wide enough to turn a long-bodied vehicle about. And if the property owners are willing to pay the extra cost for the advantages of a wide street, when it is not absolutely necessary, they should be permitted to do so.

The question of beauty has not been considered, for, given a reasonable space for lawn and trees, there is little opportunity for much improvement in the appearance of a street by narrowing.

THE QUESTION DEPARTMENT.

COST OF STREET LIGHTING.

We are paying in this town for light as follows: Arc lights, 16 in number, of 1,200-candle power, $1,200 a year ($75 a year for each light); incandescent lights, 171 in number, of 25-candle power, $20 a year for each light; gas lights, 127 in number, and naphtha lights, 20 in number, $21 a year for each light. They burn all night. Are not other municipalities getting light cheaper than this?

Norman Fox, Mayor,
Morristown, N. J.

In the fourteenth annual report of the United States Department of Labor, Carroll D. Wright commissioner, will be found detailed reports of the operations of municipal and private lighting plants. No names of cities are given in this report. One of the tables in this report gives the average price per lamp per year of arc lighting by hours of service rendered. No account of the candle power of the lamps used is made. For hours approximating the all-night schedule the average price per lamp per year to municipalities is as follows:

For 2,500 to 2,750 hours' service per year, $85.05 per lamp.

For 2,750 to 3,000 hours' service per year, $74.90 per lamp.

For 3,000 to 3,250 hours' service per year, $105.80 per lamp.

For 3,250 to 3,500 hours' service per year, $94.12 per lamp.

For 3,500 to 3,750 hours' service per year, $93.99 per lamp.

For 3,750 to 4,000 hours' service per year, $100.60 per lamp.

For 4,000 and over hours' service per year, $101.97 per lamp.

No information regarding schedule of lighting is given for incandescent or gas lights.

The average cost per lamp per year in 82 cities using 25-candle power incandescent lamps is $18.44, the maximum being $32.85, and 4 cities paying less than $10; that of 7 cities using between 150 and 200 lamps each is $19.61, the separate figures being $25, $25, $21.14, $17.50, $14.40, $12.85, $6.39.

The average cost in 87 cities using gas lamps is $19.54 per lamp per year. Those using about 127 lamps pay $17.08, $20 and $21, respectively.

In the report of the committee of the American Society of Municipal Improvements on electric lighting, for 1896, will be found detailed reports of prices in a number of cities. The cities using 1,200-candle power lamps and all-night schedule, given in the table, pay as follows: Ludington, Mich., $65; Menominee, Mich., $65; Parkersburg, W. Va., $69.35; N. Tonawanda, N. Y., $78; Green Bay, Wis., $78; Neenah, Wis., $78; Hartford, Conn., $79.20; Madison, Wis., $84.51; Mt. Vernon, N. Y., $95; Ashland, Wis., $96; N. Adams and Chelsea, Mass., $105.85 each; New Haven, Conn., $109.50; Brooklyn, N. Y., $127.75; Butte, Mont., $168.

Some recent contracts for 1,200-candle power lamps, without reference to schedule, are: Menominee, Wis., $62; Ishpeming, Mich., $90 to $99.

Springfield, Ohio, recently contracted for gas lights at $24 per lamp per year.

Milwaukee, Wis., has made a five-year contract for 60-candle power naphtha lights at $22.83; Indianapolis gets vapor lights at $16.50, and Welsbach lights at $30. St. Louis pays $27.97 for Welsbach lights.

Recent contracts for arc lights with all possible combinations of schedules and candle-powers of lights have been made at prices ranging from $48, at Elmwood, Ill., to $120, at Ishpeming, Mich., nearly all being within the limits of $65 and $90.

Morristown seems, therefore, to be paying reasonable sums for its lighting when compared with the cost in other cities supplied by private companies, but a majority of the cities pay less. Thus, 60 cities of the 87 using gas pay less than Morristown, though the average is only $1.46 less per lamp per year.

COMPARISON OF WATER METERS.

We wish to get water meters that are accurate and durable for adoption in our system, and will be glad to have any information you can give us on the subject.

R. F. Booton, Chairman Water Committee, Culpeper, Va.

Early in 1899 Mr. John W. Hill presented a paper before the American Society of Civil Engineers upon "The Accuracy and Durability of Water Meters," giving the results of tests upon a number of meters in use for measuring water for domestic purposes. This paper was discussed by a number of engineers, and additional data were given by Mr. John Thomson, Mr. J. Waldo Smith, Mr. W. C. Hawley, and Mr. E. Kuichling. The meters tested were Worthington, Crown, Hersey, Empire and Union Rotary, all piston meters; Nash, Hersey, Trident, Pittsburg, Niagara, Standard, Lambert, disc meters; and the Columbia inferential meter. These data demonstrate the accuracy and durability of all the meters mentioned for the conditions of water during the experiments and the ordinary requirements of domestic service. The conclusions of the gentlemen presenting the papers, drawn from these data, may be given in a few words.

Mr. Hill's investigation was made to aid in the selection of meters for a water-works system in a suburb of Cincinnati. He says:

As a general proposition only two or three of the meters fell so low in the author's esteem as to make them doubtful devices for the measurement of water, but any meter represented in these tests, if not damaged by use, is superior to the prevailing mode of charging for water by a survey of the premises. It should be very gratifying to all interested in the use of meters, that those meters which in these tests have shown the greatest precision of measurement, also have demonstrated their capacity to operate for a generation or longer in daily service, and still be in condition satisfactorily to approximate the quantity of water which is passed through them.

Mr. Smith's experiments showed life of meters equivalent to 92 to 164 years of ordinary use for the meters he tested, and he characterizes their performance as phenomenal. Some of them were still usable after repair. A system of natural selection seems to have been going on which has weeded out most of the meters of poor design. Mr. Kuichling says:

An inspection of the table shows clearly that the meters mentioned (four of those mentioned above) afford little room for adverse criticism, so far as durability and continued accuracy of registration are concerned, provided that the water passing through them is practically free from grit and that proper care is taken in their manu-

facture. This latter remark is prompted by the fact that in the aforesaid examination a meter was occasionally found which did not exhibit first-class workmanship or materials, and consequently gave a considerably larger ratio of actual to registered discharge at both low and high flows than appears in the table. The remedy for this condition necessarily lies with the makers and can doubtless be attained by a more rigid system of shop inspection. With respect to the design, accuracy and durability of the smaller sizes of meters, it thus appears that the mechanical problem has been practically solved, and that there now remains only the matter of improvement and commercial development. Between the different types or styles there seems to be little choice except as to cost, original workmanship and facility or economy of making repairs. The writer therefore agrees thoroughly with the author (Mr. Hill) that most of the water meters now in the market are reliable and durable, and that their use should become an essential feature of all systems of public water supply.

A CITY ENGINEER'S WAGON.

Will you kindly favor the craft with a description of a light, but strong, one-horse vehicle for use of city engineer party of four, to carry full equipments for transit and level work? *J. H. H., Ark.*

Of vehicles on the general market, what is known as a canopy top, three-spring wagon would probably answer the purpose best. It is usually built on $1\frac{1}{8}$ inch double collar axles with best oil-tempered springs and either 1 inch or $1\frac{1}{8}$ inch width tire. Body should be made of thoroughly dried hickory, poplar panels, screwed, glued and plugged. Length of body about 6 feet 9 inches, width 32 inches, with full width tail-gate, and painted black. The gear should be of hickory, thoroughly ironed, and painted in black, Brewster green, or carmine. The seats should be made with either half or full panel back and trimmed in either leather or imitation leather. The imitation leather is almost as serviceable as leather and is a little cheaper. All vehicles are made in either wide or narrow track, which is determined by the section of the country in which the wagon is to be used. The axles could also be made either arched or dropped. The drop axle is the most popular. The canopy top could be provided with roll-up curtains at a moderate cost. Rubber tires would add about one-fourth to the cost of the vehicle. The cost of the wagon described above should not exceed $100, exclusive of freight and rubber tires. No provision is made in this description for special carrying facilities for equipments, the bed of the wagon being usually sufficient. If any of our readers have any special appliances or attachments to such wagons which they will warrant to be satisfactory and worth what they cost, we will print their descriptions if sent to us. Unless the wagon is made to order their application to the wagon is likely to be expensive and unreliable.

MOLDS FOR CEMENT FORMS.

By whom can I have molds made for making cement urns and similar ornaments for lawns, cemetery lots, etc.?

D. G. Bennett, Selma, Ala.

Any foundry having an expert pattern maker can supply the molds in any usable forms and of any material desired. The makers of architectural ironwork and of similar ornaments of cast metals can probably do the most satisfactory work, their experience being in similar lines of work.

EXPANSION OF BRICK PAVEMENT.

What have you published in regard to the expansion of brick pavements? Our pavement is arched about two inches in our expansion joints of paving pitch. *George P. Slade, Village Engineer, Glens Falls, N. Y.*

On page 158 of MUNICIPAL ENGINEERING for September, 1896, are two photographs of breaks due to expansion in Newark, N. J., the pavement being laid late in 1895 and filled with cement grout. Further description of this failure, and of others, is given on page 308 of the same volume. See, also, pages 154 and 361, and page 400, June, 1896.

Remedies are suggested on page 101, August, 1897; page 275, November, 1897; page 198, April, 1898; page 273, May, 1898; page 308, November, 1898; in an article by Geo. R. Grimes, on page 180, March, 1900. See, also, the answer following on "Cement Filler for Brick Pavement."

TARRED MACADAM.

Have you investigated the subject of tarred macadam for city streets, and if so, have you published any conclusions on this subject?

L. B. Kuhn, Moline, Ill.

MUNICIPAL ENGINEERING has collected and published all the available information of value upon the subject of tarred or bituminous macadam. The various pavements laid at Hamilton, Ont., have been described and some of the specifications given in articles which appeared on pages 283, October, 1900; 362, November, 1900; 423, December, 1900; 84, February, 1901; 181, March, 1901; 296, May, 1901; 322 and 370, June, 1901. The article on page 322 of the June number

is by F. J. Warren, who shows the defects of the Hamilton method by description and pictures. It is one of a series of articles by him; others on page 204 of the April number, on "Coal Tar for Paving Uses," and on page 262 of the May number on "Some Experiments in Laying Bituminous Macadam," giving theoretical and practical discussions of portions of the subject. We hope to have other articles from the same author which will throw still more light upon the problems involved. Mr. Warren's warning comes in good time to induce a thorough investigation of materials and methods before errors in either or both throw this class of pavement into disrepute, which may be undeserved. If he is correct in his adverse criticism of recent construction, much waste of money may have been saved by the halt he has called. If the pavements are good, or if Mr. Warren or Mr. Whinery or others have something which is good, judicious experiments, some of which are now under way, will soon show the facts. Conclusions can not be drawn at this time. All that can be said is that there is great promise of good streets for light traffic at low cost, and that it is sufficient to warrant experiments on a reasonably large scale by the cities of the country.

Another class of bituminous roadways is that in which oil is used. There have been several articles upon the use of this material on roads in the magazine, the most detailed being an article by T. F. White, on page 28 of January, 1901, on "Good Roads and their Benefits." See, also, page 214 of April number.

STRENGTH OF BROKEN STONE AND GRAVEL CONCRETE.

I never could make myself believe that one of cement to three of sand and six to seven of broken stone can possibly make a concrete strong enough to make a durable bond. What do practical men say? Why is not gravel better than broken stone? Being harder, the concrete should be stronger.

G. S. Neff, Rochester, N. Y.

The proportions of the materials in concrete must be varied according to the kind of cement used and the duty required of the concrete. A concrete made of one part natural hydraulic cement, three parts sand and six to seven of broken stone would not prove satisfactory for very many uses. The proportions for natural cement are seldom greater than 1 cement, 2 sand, and 4, 4½ or 5 of stone or gravel.

For concrete the amount of mortar should be sufficient to just fill the voids in the stone or gravel used. The amount of cement can be varied with the strength required in the concrete. In the "Directory of American Cement Industries and Hand-Book for Cement Users," many specifications for all kinds of work are given. For arch work, as at Kansas City and Indianapolis, the proportions required were 1 sand, 2 Portland cement and 4 broken stone or gravel, in arches, or 7 to 8 parts in foundation. The Illinois Central Railroad specifies 1, 2 and 5 for natural cement, the same for Portland cement concrete in arches, and 1, 2½ and 6, for Portland cement concrete in bodies of piers and abutments, wing-walls, etc. For foundations of cement walks, Pittsburg uses 1 Portland cement, 3 sand and 6 broken stone or gravel. Indianapolis uses 1, 2 and 5; Milwaukee, 1, 3 and 5. In concrete floors, 1 Portland cement, 3 sand and 6 broken stone is good. Ordinarily, 1 Portland cement, 4 sand and 6 to 8 of broken stone or gravel is sufficient.

Average specifications for the best foundation work may be stated, for natural cement, as 1, 2 and 4 to 5, and for Portland cement, as 1, 2½ and 5 to 6. Good concrete for less duty can be made with a smaller proportion of cement if the proportion of mortar to stone is kept the same.

Experiments on the relative merits of gravel and broken stone for concrete indicate that with natural cement the broken stone concrete is materially stronger than gravel concrete, but that with Portland cement the difference is less and may even be in favor of gravel. The gravel stones are harder and tougher than the usual broken stone, but the adhesion of the mortar to the rough surfaces of the broken stone is greater than to the smooth gravel surfaces. The older the concrete, if it is well made, the closer the bond and the stronger the concrete becomes. Dirt has even more effect in preventing good bond in gravel than in broken stone, and strict cleanliness should be demanded.

In the recently completed Third street tunnel in Los Angeles the specification for the concrete used in the walls called for one barrel of Portland cement in the packed condition in which it is sold to six barrels of the same size of the aggregates, i. e., sand, gravel and broken stone shoveled full but not otherwise compacted. As interpreted by the contractors, this is but little stronger than the mixture 1 cement, 3 sand and 6 broken stone or gravel, and is considered by the engineers who supervised the construction to make very strong concrete for the thickness of the walls used.

In concrete masonry for locks the general proportions for Portland cement concrete are 1 part Portland cement, 4 parts gravel

and 4 parts broken stone. In particular situations this is increased to 1, 3½, and 3½ respectively. Natural cement concrete is made in the proportions 1, 2½ and 2½ of the materials named.

STREET CLEANING MACHINERY.

Who makes a first-class crossing sweeper? Is it practicable to use them during the day for the general cleaning of the streets in such a city as ours, where we have adopted the plan of hand sweeping for about forty blocks of the business part? In the residence section we have the old style rotary broom sweepers, but much complaint of their dust is made. Are there not improved sweepers in use which are not so very expensive?

Willis H. Post, Bloomington, Ill.

The lawn-sweeper, a picture of which will be found in our advertising columns, should make a satisfactory crossing sweeper, especially if the streets are kept continuously in fair condition. It might also be used for day work in business districts which are kept clean under the usual program of a thorough machine sweeping at night and slight hand sweeping by day to remove droppings, etc.

In our advertising pages will also be found the advertisements of several street sweepers which have been designed with special reference to the prevention of clouds of dust. Most of them are automatic loaders. When the expense of extra wagons and teams to load sweepings is taken into account, these combination sweepers and loaders are not much, if any, more expensive than the sweepers, wagons and teams purchased separately.

DESCRIPTIONS OF SEPTIC TANKS.

Our city is about to install a part of its sewerage system which does not admit of disposal by dilution, the stream not being large enough. Can you refer me to descriptions of septic tanks having a capacity of about 600,000 gallons in 24 hours and giving approximate cost?

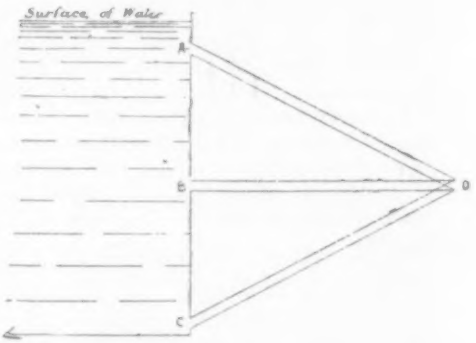
J. M. Bandy, City Engineer, Greensboro, N. C.

No plants of this size have yet been put into good working order on the best system in this country, and descriptions of foreign plants are but partially applicable in this country, for reasons stated on page 18 of the July number. Neither is it now possible to estimate in advance the size of plant necessary by comparison with another in operation, as shown in the same article. The description of the Liberty, N. Y., plant, on page 1 of the July number, will be an excellent guide for experiments on a new plant for septic tank and filtration. The description of the Champaign, Ill., plant, on page 158, March, 1899, will give a basis for a simple septic tank. Each of these plants takes care of about 200,000 or 300,000 gallons of sewage a day. Increase in the number of tanks, rather than increase in their size, seems to be the proper method of increasing capacity. Thus far it seems to be necessary to determine the proper dimensions for each tank to produce the maximum purification by experiment upon the particular sewage to be purified. This can be done with a single tank at comparatively small expense, the result controlling the design of the complete plant.

FLOW OF WATER IN PIPES.

In a recent examination of engineers in England the following question was asked:

If three pipes of equal diameters, AD, BD, CD, be laid to draw from a reservoir of water (see diagram), through which, if either, will the velocity be greatest, and why?



This question is answered in a prominent English engineering periodical, as follows:

The velocity of efflux from the reservoir through short pipes varies directly as the square root of the effective head measured from the level of the top of the water to the center of the outlet, so that, for short pipes, A D would have a less velocity of efflux than either B D or C D would. The velocity of discharge at the point D varies inversely as the square root of the length of the pipe, so that B D will have the greater velocity on account of its lesser length. It should be noted that the force of fluid friction very much depends upon the velocity being indefinitely small when the speed is slow. It does not depend upon the pressure, but is proportional to the area of the wetted surface. At moderate speeds it does not much depend upon the nature of the wetted surface.

A correspondent of a prominent American engineering periodical in a similar case gives the dimensions, AD, on uniform grade, and B D, level, each 1½ miles of 10-inch pipe; A, 5 feet below water surface, and B 600 feet below water surface, and asks three questions:

(1) Both pipes are closed by valves at the lower end, giving pipes time to completely fill. If both valves are opened simultaneously, what will be the relative amount of water discharged by A and B for a short period of time?

(2) After the pipes have been flowing long enough

to reach their normal flow, what will be the relative flow?

(3) At what depth below the surface of the water must the intake end of pipe A be placed to give the same flow as B?

The editor replies as follows:

(1) Since, under static conditions, the pressures at the lower end of the pipes will be the same, the volume discharged from the two pipes will, for a short time after the opening, be substantially equal.

(2) Whether A will continue to discharge as much as B when the flow becomes normal depends on two conditions, viz.: (a) the relation between the friction in the pipe and its slope, and (b) the resistance to the entry of the water into the mouth of the pipe. Since the total head (the force tending to produce motion) and the total friction (the force tending to retard motion) are assumed to be the same in the two pipes, the amount of water delivered should be the same unless the force is so applied as to pull the water in one part of the pipe away from the water in the other. This actually occurs in pipes of very steep grade, and is made use of practically in the Sprengel vacuum pump, where the pipe is placed vertically. The square entrance of the pipe will exert a material retarding effect on the water passing through it. In answer to (3) it may be said that the intake end of the pipe A should be so far below the surface of the water that the head from there to the surface will be in the same proportion to the total head that the resistance of the water to entrance is to the total resistance (entrance resistance plus pipe friction).

It will be a good hot-weather exercise for our readers to compare the two answers, point out the errors and make them as definite as the questioner desires and the data permit. In the first answer it is assumed that the pipes are short, but under the terms of the question they can be assumed to be 1½ miles long if desired. What should be the answer under each assumption?

CEMENT FILLER FOR BRICK PAVEMENTS.

We are about to pave Main street and the council is thinking of using cement grouting. We will have a 36-foot paved roadway and it is suggested that we grout say 25 feet through the center leaving the unfinished portions to take up any expansion or contraction that may occur. What would you suggest? What kind of cement should be used?

Geo. D. Jenkins, Borough Engineer, Waynesburg, Pa.

The expansion of brick pavements is apparently due to rise in temperature. The writer has never had any trouble with brick pavements laid in hot weather, but other engineers have reported some trouble after a year or two. Pavements laid late in the season have been known to rise sufficiently to break the arch formed and greatly injure the pavement. The usual effect, however, is to cause a rumbling noise when driving over it. The later in the season the pavement is laid the greater the precautions that must be taken. It is usually considered sufficient to make a tar or asphalt joint at the curb and an occasional joint of the same sort across the street, say once in 50 feet or so. The cement filler preserves the edges of the brick, and the joints should be made where the traffic is least, as along the gutter, and as narrow as possible where they are across the line of traffic. The filler acts also to shed the water from the pavement and some feet of unfinished surface would be objectionable to the extent that it would let water through to the foundation.

The "Directory of American Cement Industries and Hand Book for Cement Users" gives a method of applying the cement filler which works well in practice, applying first a mixture of 1 part of Portland cement and 1½ parts of sand and following with a finishing coat of one part of each, completely filling the joints. The best quality of Portland cement, setting promptly but not too quickly, should be used.

POWER FOR SMALL PUMPING PLANTS.

Under the above heading you gave on page 24 of the January number a table of cost of pumping water with oil, gasoline, gas and steam engines. What is the amount of lift for which the figures are correct?

Subscriber, Lewiston, Idaho.

For the purposes of the comparison the height to which the water was pumped is not essential, but to get a correct idea of the actual cost or to compare with other tables this height is very necessary. Mr. Freeman C. Coffin, who prepared the table, states that the dynamic head upon which the table is based is 210 feet, this being an approximation to the average head in different places as given in water-works statistics.

HOW TO PREVENT CRACKING OF TOP COAT OF CEMENT WALK.

Is there any substance that can be mixed with the finishing coat for cement sidewalks to make it set faster and to make it less liable to crack?

——— ———, *Wellsboro, Pa.*

If good materials are used, the top coat of a cement walk cracks most frequently because it is not well bonded with the base. Anything which would tend to hasten its setting would affect this bonding and increase the liability to crack. The better treatment is to put the top coat on before the lower surface has set, and to use throughout a cement which does not set too rapidly. The finished pavement should then be protected from the sun until it is thoroughly set, say three to five days. Some water applied from time to time will aid the process of setting, if put on carefully when the walk is not heated up by the sun. It is best applied at night, or very early in the morning. Time to set and care in laying and bonding with the lower layer, aided

by the treatment suggested, are the best means for preventing the cracking complained of. Good materials are of course assumed as essential.

The "Directory of Cement Industries and Hand-Book for Cement Users" ($5) gives methods of laying walks, in full detail, and for making and laying concrete for many other purposes.

BOOKS ON MUNICIPAL GOVERNMENT.

Is there a book on conducting the work of a municipality, to enlighten the intendant and wardens (mayor and council) in the discharge of their duties? *John W. Taylor, Summerville, S. C.*

Among legal and general books discussing the government of cities may be mentioned: Eaton's "Government of Municipalities," Maine's "Village Communities," Mechem's "Treatise on the Law of Public Offices and Officers," Pomeroy's "Introduction to Municipal Law." Specific instruction regarding methods of procedure can only be obtained from books written for the particular state. Adkinson's "Township and Town Officers' Guide" and Burton's "Elements of Civil Government in Illinois" were good books for Indiana and Illinois, respectively, at the time they were written, but they must be revised after almost every session of the legislature, and would be of only general value in any other state. The writer knows of no similar book for South Carolina. For aid in beginning and carrying through public improvements, McCullough's "Municipal Public Works" (50 cents), Robinson's "Improvements of Towns and Cities ($1.25) and Goodhue's "Municipal Improvements" ($1.75) will be valuable. The prices are not in strict proportion with the values of the books.

FORMULA FOR SENSITIZING BLUE PRINT PAPER, AND PROTECTING FROM MOISTURE.

Will you please give the proper formula for mixing the proportions of chemicals to get the best results for blue prints, white line on blue ground?
F. E. Halladay, C. E., Plover, Wis.

The following formula is easy to follow and works well:

(1) { 1⅞ oz. citrate of iron and ammonia.
8 oz. water.
Mix thoroughly.

(2) { 1¼ oz. red prussiate of potash.
8 oz. water.
Mix thoroughly.

Keep the two solutions separate until ready for use. For an ordinary blue print, mix equal portions of the two solutions. If a very dark blue ground is wanted, use two parts of No. 1 and one part of No. 2. Fresh solutions give the best results, and fresh mixture of the two solutions is especially required for the most satisfactory work. The work of sensitizing the paper should be done under red light, or if in daylight, greatly diffused. The liquid should be applied evenly with a wide, smooth brush, not too thickly. The paper should be hung to dry in the dark in such manner that it will not wrinkle or fold. Two essentials of good blue prints are close contact of negative and paper in printing and thorough washing in running water.

If blue prints are liable to discoloration by rain or dropping water, they can be protected by applying paraffin. The best way of applying it is, first to dip a number of cloths about one foot square in melted paraffin until saturated, in which condition the cloths can be stored. Second, transfer the paraffin to the blue print by spreading a waxed cloth on a smooth surface, non-absorbent preferred, putting the blue print on this, and a second paraffined cloth on top. Use a moderately hot flatiron to melt the wax and cause the paper to absorb it. The lines of the drawing are intensified, the paper does not shrink or become distorted, is translucent and waterproof.

QUESTIONS AS TO SEWER ASSESSMENTS.

We have now in California two distinct and separate street laws, one of which was passed by the last legislature, and municipalities have the option of working under either of them. The new law is not yet in general use, and the old one, the so-called "Vrooman Act," which is a front foot assessment law, has been so warped and twisted by the supreme court, especially by a late decision, that no contractor dares to bid under it. Under the new law, the assessment must be "according to the benefit received" by any particular lot.

How is the benefit to a lot by a sanitary sewer to be measured: by the front foot, square foot, or assessed valuation? Or arbitrary, at the will of the city engineer, who is the one to make the assessment under the law?

Suppose two lots of equal frontage and area, similarly situated in regard to the sewer lines, but in different parts of the assessment district, so that one is assessed for taxes, say, 25 per cent. more than the other (for the land only, here the improvements are assessed separately), and that is the only difference in the two lots, how should these lots be assessed "according to the estimated benefits received by each?" Respectfully,
N. S. Frost, City Engineer, Petaluma, Cal.

These questions arise very frequently and have been quite fully discussed in this and other departments of this magazine. See the following articles: on pages 215, October, 1898; 313, May, 1899; 32 and 33, July, 1899; 97, August, 1899; 247, April, 1900. There are also many references to decisions of courts upon special sewer assessments. The general principle upon which the as-

sessments must be based is benefit derived from the sewer. Even in a new city this is not strictly proportional to the frontage, especially if a lot fronts on two sewers, but area, the character and extent of improvements, and the amount of use made of the sewer are all important factors. A careful study of each particular case is necessary. It will be well to base on the information thus obtained a general rule, perhaps taking frontage as the most important element, but distributing a part of the cost in proportion to area, a part in proportion to valuation of lot, a part in proportion to valuation of improvements, and a part on the basis of the observed or estimated amount of water used. This latter item may be added only to those properties which use more than the ordinary amounts allowed for domestic purposes. An attempt to reduce this latter charge to an annual rental has recently been successful, in part, in a Massachusetts town.

Even after such a rule is formulated it will be necessary to make a few exceptions, for it is practically impossible to make a general rule which will exactly fit every condition existing. If the rule is properly formed there will be very few such exceptions, and most of them will not be subjected to particular hardship if the rule is strictly applied.

THE INDIANAPOLIS CONVENTION OF THE INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.

The twenty-ninth annual convention of the International Association of Fire Engineers will be held at Indianapolis Tuesday, Wednesday, Thursday and Friday, Aug. 27 to 30, 1901, beginning at 11 o'clock on Tuesday morning. The sessions of the convention will be held in the Masonic hall, at Washington-st. and Capitol-ave., opposite the state capitol. The number of exhibitors and the size of the exhibits is so great that Tomlinson hall has been secured to give room for them. This hall belongs to the city and has the largest auditorium in the city. It is on the corner of Delaware and Market-sts., opposite the court house, and five blocks from the place of meeting. Both halls are in close proximity to the center of the city, to the hotel district, the central points of interest and the starting points of street car and interurban railway lines.

A meeting of the board of directors was held in Indianapolis in April to prepare a program for the meeting, and the result of their labors is a very attractive list of subjects for discussion. The plan of presenting topics, each in charge of one or more persons to open the discussion and give it direction, was adopted. The topics selected and the persons selected to present them are as follows:

No. 1. "The danger to life attending firemen when at work fighting fires by electric light and trolley wires. What is the remedy, and how can it be enforced?" Morris W. Mead, superintendent Bureau of Electricity, Pittsburg, Pa.

No. 2. "The danger of chemical explosives, their kind and character, and what would be the best enforced method to prevent them?" William McDevitt, inspector Fire Insurance Patrol, Philadelphia, Pa.

No. 3. "Cisterns as water supply as compared with hydrants." D. J. Swenie, chief fire marshal, Chicago.

No. 4. "Does the present method as practiced by fire chiefs in fighting fires unnecessarily increase losses by water? If so, what is the remedy?" J. D. Paige, chief fire marshal of Joliet, Ill.

No. 5. "The necessity of regular inspection of buildings, automatic sprinklers, stand-pipes and fire-escapes." Chiefs T. J. McConnell of Buffalo and Charles E. Swingley of St. Louis.

No. 6. "Driven wells for fire purposes." J. C. Spencer, chief of Janesville, Wis.

No. 7. "Upon what basis or plan should private fire departments be organized, equipped and drilled to make them efficient, and should not their chiefs be in close touch with the chief of the city fire departments?" Herbert Heston, chief fire marshal of the Pennsylvania railroad company, Philadelphia.

The question box suggested at the St. Louis convention was adopted by the board and will be in readiness to receive topics or subjects which any delegate may desire to hear discussion upon. The topics presented are live questions upon which reports of experience will be numerous and valuable. The number of questions is not too great to permit full discussion of each and to admit some additional subjects if any of importance are dropped into the question box.

The local committee of the whole, with Evans Woollen as chairman, is arranging a very attractive program of entertainment for the visitors, the chairmen of the subcommittees being active in their various lines..

Nelson J. Hyde, chairman of the Board of Public Safety, is chairman of the entertainment committee. In the program in preparation by this committee are an evening excursion to Broad Ripple with satisfactory refreshments for the inner man, an evening at Fairview as the guests of the street car

company, a lunch at Fair Bank and an afternoon trip around the Belt Railway to show the great advantages of the city for locating manufactories, serving them with transportation facilities and protecting them from fire losses. This trip will include a stop at the water works. The journey around the city, with a view from the monument, will make many of the visitors more familiar with the city than a large number of its citizens now are.

Chief Thos. F. Barrett is the chairman of the reception committee, a guaranty that nothing will be left undone which will give the incoming visitors a proper introduction to the duties and pleasures of the convention time. Those who may happen to be unacquainted with his face can recognize him by his activity, with a little aid from the photograph which is reproduced on this page.

John H. Mahoney of the Board of Public

CHIEF T. F. BARRETT, INDIANAPOLIS.

Safety is chairman of the committee on badges.

Wilson S. McMillen of the Board of Public Safety is chairman of the committee on exhibits. His duties will not be light, but they will be well performed.

A ladies' entertainment committee is also provided for, which will take the ladies accompanying delegates in charge.

Edward H. Davis, secretary of the Board of Public Safety, is also secretary of the local committee of the whole and will readily give any desired information regarding the convention and the local details as rapidly as they are completed.

An attendance of 450 to 500 delegates is expected, and the outlook is favorable for a more than usually successful convention.

M. S. Humphreys of Pittsburg, Pa., is president of the association; Henry A. Hills of Wyoming, O., is secretary; D. J. Swenie of Chicago, C. E. Swingley of St. Louis and J. W. Dickinson of Cleveland are the other members of the board of directors.

A few points regarding the fire department under the charge of Chief Barrett will be of interest to visitors.

He has been collecting with considerable difficulty the items of interest in the history of his department and the information given is taken from his record in advance of the publication of his report.

The paid fire department was organized in the fall of 1859, drivers drawing full pay and minute men being paid $15 a month and expected to be at work near their engine houses and on call for service at fires at any time. The first chief, Joseph W. Davis, was paid $300 a year. The first steam fire engine was put in service March 31, 1860. The first tower watchman was appointed in 1863. The first fire alarm system was installed in 1867 with forty-six signal boxes. The first fire cisterns were built in 1870, and the water works were put in service in 1871. At this time the department had thirty-seven regular men, twenty-two minute men, six engines, six hose reels, one hook and ladder truck, fourteen horses and 6,000 feet of rubber hose. Daniel Glazier was chief, with a salary of $1,300 a year. The cost of maintaining the department in 1872 was $48,644.

Thomas F. Barrett was appointed chief engineer in 1897. The department has grown with the growth of the city until, according to the report for 1900, there were 176 men, all on the regular pay-roll, nine engines, twenty hose wagons, one water tower, one aerial truck and four service trucks, three chemical engines in service and one in reserve, ninety-seven horses and 34,221 feet of hose. The cost of maintenance was $175,738. Since this report was made material additions to the equipment have been made and Chief Barrett has now or will soon have,, two new engines, three new service trucks and one aerial truck, and three new hose wagons to exhibit, with thirty-seven additional men and the necessary horses to move the machinery.

A new central station equipment for the fire alarm telegraph will be installed before the date of the convention.

Illustrations of some of the engine houses showing the standards of size and design accompany this article. The apparatus occupying each house, with men and horses, are grouped in front of the house.

SEWERAGE AND SEWAGE DISPOSAL.

By Solon C. Smith, Jackson, Ohio.

Sewerage has now risen well nigh to the dignity of a science, certainly to a worthy place among the various branches of modern engineering. Storm-water sewers and the so-called sanitary sewers were always a mismated pair and can seldom be domiciled together, except, perhaps, in the case of the very largest cities. A sewer that is large enough to accommodate the rush of a summer freshet is so large that in the interval of no rain that follows only a mere thread of slop-water meanders along its broad invert. Solid particles, unless fully immersed in water, become stranded. These solid particles undergo slow decomposition, the kind of decomposition that produces sewer gas. The amount of water necessary to flush so large a sewer daily is unreasonable and cannot be supplied by a self-operating flush tank. Sanitary sewers are now made small, so small that the daily flow will keep them half full or more. They flow best when 93 per cent. full, but the air space in the crown above the liquid would then be too small for thorough ventilation. It is interesting to note that a twelve-inch line, for instance, with a fall of only one foot in 200, and running only half full, and for only sixteen hours of the twenty-four, will accommodate 8,500 people, even though every one of them supply seventy gallons of sewage per day.

Sanitary sewers are sometimes very advantageously accompanied with a drain tile to remove ground water, but from the sewer proper ground water and storm water are rigorously excluded by well cemented joints.

Stoppages seldom occur in the trunk line, even though the grades be very flat, but unless flush tanks are provided they are frequently in the higher levels, where, though the grades may be steeper, the flow is small and intermittent. A twelve-inch sewer running full, or half full (which will give just the same velocity) is fairly safe with a fall of one in 400, or even more if carefully laid. The laterals, which should not be less than six-inch nor more than eight-inch, will work with one in 200 or even 250 if flush tanks are used. But the house connections, which are always four inches, must have one in 50, and then be allowed to drop in almost at the crown of the lateral. Lower grades are not absolutely prohibited. There is said to be a sewer in Kalamazoo, Mich., more than a mile long, which has a fall of only one in 1,200 and has given no trouble in its life of sixteen years. We even read in the New York state board of health reports of a four-inch sewer 2,800 feet long with a total fall of only three inches, which has done service for nine years without interruption. It is said to be provided with a flush tank, and we fancy it must work under a slight head during the flushing.

Flush tanks keep the laterals rinsed out clean and in a sanitary condition. Fresh sewage is not offensive. Every dead end of every lateral should be provided with a flush tank. These should work automatically and discharge of their own accord about once in 24 hours. There are many makes but the Miller Patent has the distinction of having no valves, small pipes or moving parts. A six-inch siphon is guaranteed to discharge 300 gallons in 40 seconds and an eight-inch siphon 500 gallons in 30 seconds. Their effectiveness depends on their ability to fill the lateral chock full for a little time. They are supplied with a tiny trickling stream of water from a cock so gauged that in the required time the level in the tank will rise to the going off point.

Man-holes are so placed that there is one at every change of grade and every change of alignment. A lamp-hole can occasionally take the place of a man-hole. Obstructions can then be located, and, if not due to breakage, can generally be removed by making connection with the waterworks and turning on just sufficient presssure.

My home town lies sloping in two directions, on the two sides of a tongue of land, and we have our choice of running the trunk line around the point of this tongue and back on the other side, or of siphoning the sewage from one side across the saddle of the ridge to the other side. A pump must be used to lift the sewage into the disposal works. Some one has invented a pump that will take care of itself. A float on the surface of the rising liquid connects an electric current which operates an air compressor, which, in turn, forces the accumulated sewage out of the air-tight receptacle.

It was formerly thought best to trap off the sewer completely from all connection with the open air, but our best engineers now advocate not only flushing, but ventilation. The house is trapped off, of course, but a large ventilating pipe is run up through the house and given free vent to the open air above the roof. If perforated covers are then placed upon the manholes at the surface of the ground the short and tall columns of air all over the city, coupled with their unequal heating, give ample ventilation to the laterals and house connections.

*From a paper before the Ohio Institute of Mining Engineers.

The early settler threw his slops on the ground and the ground purified them. By and by the villagers found this created a nuisance and they provided drains emptying into the creek. But as cities became populous and homesteads dotted the banks of every stream, only the very largest rivers could sufficiently dilute the filthy tide to render it innocuous. The question soon arose, what rights has a man that his neighbor is is bound to respect? The farmer asked, Must my stock drink foul water? The sportsman mourned the fish that were driven out, and City No. 2 said to City No. 1, higher up the river, keep your offal out of this water, I have to drink it. The state steps in and says when sewage shall be purified.

Various expedients were tried. Fire is the universal purifier and it was first tried, but it was too slow and expensive. A. C. Herman, sewer commissioner of St. Louis, says sewage is usually 99 8-10 per cent. water, 1-10 per cent. inorganic matter and 1-10 per cent. organic. Straining was tried. The electrician and the chemist were consulted, the latter most successfully, and for years chemical precipitation was the approved method. Settling tanks are provided where the sewage is received and

WESTERN HOUSE, INDIANAPOLIS.

Engine and Hose Company No. 6. West Washington Street, Near West Street.

treated with chemicals, the effluent is turned into the neighboring stream and the sludge is disposed of in some way. Chemicals are expensive. After all the most that has been accomplished is to put off the evil day, to postpone the time of putrefaction. The sludge is in the way and much organic matter escapes in the effluent. The inevitable must come, all this matter must decay somewhere and before long. All

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Chemical and Hook and Ladder Companies, No. 2.

processes that depend upon antisepsis, or the arresting of decay, are flying in the face of nature and only prolong the agony.

Nature designed a system of sewage disposal before sanitary engineering was heard of. As the primitive elements of matter can only be locked up into organic forms under the influence of life, so only can these same first elements be unlocked from their places in the composition of organic things in the presence of, and under the influence of, life. Bacteria furnish this life.

No decomposition can ever take place without bacteria, except perhaps that effected by fire and a very inconsiderable amount effected by certain chemicals. Kill all bacteria in a vessel of nutrient material and exclude all others, and it will keep indefinitely; as every housewife knows, in effect, when she cans fruit. Bacteria are the important and almost the only agents of universal hygiene. To quote Pasteur, "If there are still living beings, if since the hundreds of centuries the world has been inhabited, life continues, it is to them that we owe it. Without them the surface of the earth would be covered with dead organic matter, the remains of plant and animal bodies, which, retaining the elements necessary for the building up of new plant and animal bodies, would soon cut off the food supply of new plants and animals. Life would be impossible because the work of death would be incomplete, because the

return to the atmosphere and to the universal kingdom would be wholly suspended."

Bacteria then are nature's choice of the agencies for sewage disposal, and the sanitary engineers of the twentieth century are ready to follow suit. But nature needs assistance. We must cultivate these little plants. Partial decomposition is offensive, complete decomposition is not. The ultimate and final products of decomposition are such comparatively simple gases as carbonic acid gas, marsh gas, hydrogen and nitrogen, and these are neither offensive nor harmful, while some of the intermediate products of decomposition are noisome and dangerous. These are, generally speaking, the more highly compound gases, and the results of incomplete decay.

The most ideal sewage disposal works would be the one that could most quickly and completely break up the highly complex organic compounds into the simple inorganic elements. The septic tank supplemented by intermittent filtration beds is the highest type we have yet reached. We build lofty chimneys to assist and quicken natural combustion; we build tanks and filter beds to assist and quicken natural decay, tanks to avail ourselves of the work

MARYLAND STREET HOUSE, INDIANAPOLIS.
Hook and Ladder Company No. 1 and Hose Company No. 13.

of the anaerobic bacteria and filter beds to multiply the numbers of the aerobic.

There has been so much twaddle about germs, and so much rot in the semi-scientific columns of newspapers about microbes, that the popular mind has not yet clarified as to the nature and offices of the widely different kinds of bacteria. The best preparation for the study of sewage disposal is a patient perusal of some good work on bacteria and their products written within the last two or three years. Any ingenious mechanic can take care of the mechanical features if he understands the objects and purposes.

The essentials are a septic tank or artificial rotting chamber large enough to contain one day's flow or a little more, about ½ cu. yd. per inhabitant, shut off from the air, and filter beds of about three times that capacity where the effluent from the tank can be turned on and off at intervals. The contents of the septic tank should stand about six feet deep and the inlet should be well toward the bottom, so the sewage will not carry down much air with it, nor allow the gases to escape back into the sewer. The outlet should be a few inches below the surface so as not to gather the scum from the surface nor the sediment from the bottom, and should be so constructed as to cause no strong currents. Perhaps the best form is a pipe extending across the tank at the proper hight and split on the under side. This pipe should be given an upward turn for several inches just after emerging from the tank in order to keep the hight of the liquid in the tank constant. Otherwise scum will enter the pipe, and otherwise a ring of half-dried matter will accumulate around the walls where the level rises and falls. It is in this ring, if anywhere, that pathogenic germs will survive the actions of the tank. The shape of the tank is of no importance, but care should be taken to so arrange the inlet and outlet that the sewage will not be carried directly from one to the other before settling. Sometimes the tanks are long and they are at opposite ends. Sometimes several partitions are built extending part way across from first one side and then the other.

Sometimes the tank is circular, with a pump well in the center where pumping to a higher level is necessary, in which case a tight partition is built from the outer circular wall to the inner and the openings are on opposite sides of this partition. A floor is unnecessary unless the circumstances are very peculiar. The dangers from the liquids percolating through the soil has been greatly exaggerated. The walls are of brick and cement. A cover is not quite so necessary as might be inferred from the statement that light and air must be excluded. A heavy scum forms in time that excludes both very satisfactorily. But for many practical as well as sentimental reasons the tank should be covered. Accidents may befall children and employes. The contents may become too much chilled in the winter season. Like the baker's bread, it must be kept warm or the yeast will not work. The yeasts and the bacteria of putrefaction are closely allied species. The cover is sometimes merely the brick walls brought together in an arch, sometimes sleepers and a plank deck, sometimes I-beams and corrugated steel covered with concrete. Sometimes any rough material with several inches of loam on top.

The filter beds should be from four to six feet in depth, though shallower ones often answer. If inclosed by a wall of brick laid in cement, well and good, but an earth embankment is sufficient, or drain tile, laid plentifully underneath from the proper outlet. If the amount of elevation will permit, a secondary filter to receive the effluent from the primary is often advisable, especially where a high degree of purity in the final effluent is important, as where a water works intake is no great distance down stream. Filter tanks have been in use much longer than septic tanks. They have been used for treating raw sewage, and for treating the clarified product from chemical precipitation plants. In such cases they require a greater area.

Akin to these is the broad irrigation system, or land treatment, where the raw sewage is run out onto sewer farms, or run into a system of subsurface drains of porous tile, to be taken up by soil and growing crops. This system is best adapted to sandy soils. Berlin, Germany, has such a soil, and is the largest city that ever adopted the broad irrigation system. She has a sewer farm of 23,000 acres, costing ten million dollars. She uses only half of it, but this half is about five miles square, and as large as the city itself.

The ideal material for artificial filters is crushed charcoal, not only because of the air it carries in the usual voids, but because of its porosity and the load of air it carries in consequence. But charcoal is scarce and expensive. The next choice falls on crushed coke, being very similar to charcoal, and municipalities would do well to bear the expense, though heavy. Crushed cinders from which the ashes have been sifted or winnowed is a close second and very cheap. Furnace slag, called cinder with us, if crushed fine enough, would be acceptable. For it must be remembered that it is not the material that determines the utility of the beds, but the size and shape of the particles, or, rather the size and shape of the voids for carrying the air and sustaining

capillary attraction. It does not operate by straining. Its action is purely biological. Crushed glass or porcelain would, however, be an inferior material because these microorganisms do not adhere readily to such smooth surfaces. Burned clay or brick, crushed, are useful and clean, coarse, sharp sand is excellent, especially for the secondary filter, which should always be finer than the primary. Gravel is good for the primary if sifted over a quarter-inch mesh. Coal slack might work, but I fancy it would choke, unless, perhaps, when from mines where the coal broke with a more or less conchoidal fracture.

Every town of any size without a sewer system is full of septic tanks under the old-fashioned name of cesspool. What is new about them is our knowledge of the process that takes place in them. They differ also from the cesspool of our grandfathers in the outlet, inlet and cover and in the time the contents remain there, the scale upon which they are built and the fact that they are intended only as a prelude to a further process.

At this point recall distinctly the meaning of four words—saprophytic, parasitic, aerobic and anaerobic. Perhaps also facultative and pathogenic. Saprophytic bacteria have the power of obtaining the nutriment they require for their building up and for the carrying on of their vital functions from dead vegetable and animal tissues, and from dead tissues only. Parasitic bacteria are those which are able to flourish on or within the substances of living plants or animals. Some of these parasitic species are pathogenic, or disease producing, and some are not. There is a small class that are said to be facultative, because they can adopt either mode of life, and among them are some of our most dreadful foes. But with none of these kinds have we anything to do except the saprophytic. These may be aerobic or dependent upon the oxygen of the air for their support, or anaerobic, flourishing best where air and light are excluded.

The anaerobic act first. They are the bacteria of putrefaction. They disintegrate the solid animal and vegetable matter in the tank, liquefy it and bring it into solution. The aerobic act upon these disintegrated and liquefied compounds in the filter beds and by a process of oxidation change them into harmless gases. One process is supplemental to the other. One group performs what the other can not. When the waste products of human life enter the tank they carry with them millions of bacteria, generally estimated at from ten to twenty millions to the cubic inch. Under such suitable environment as they find there their numbers quickly rise to six or eight or ten hundred millions to the cubic inch, as nearly as can be estimated. The complex nitrogenous substances are broken up and liquefied.

Substances like paper, starch and woody fiber, containing cellulose in various forms, are changed by a process of hydrolysis. As only the liquid and such substances as are soluble can escape from the tank, other portions remain until the process is complete. The action that takes place might be compared to the process of combustion. If it had been burned in a furnace only the ash would have remained; all else would have been driven off as gas. The bacteria have taken the place of heat. All the solid matter that remains permanently is the ash. The remainder has not all escaped as gas, however. Much of it became soluble in water and went out in the effluent. This gas, containing marsh gas and hydrogen, will burn with a colorless flame if ignited at a small vent in the cover of the tank. When not ignited there is no disagreeable odor, as it is free from sulphuretted hydrogen.

The effluent from the tank is of a dark, chocolate color, containing not only matter in solution, but in suspension in a very fine state of sub-division. It is sometimes made to run over an apron in sinuous courses to aerate it before reaching the filter beds. There every particle of sand in the filter receives a thin coating of liquid, which is equivalent to spreading it over a thousand acres, and the voids between furnish air to every part and parcel of this area. Suppose the material in a bed six feet deep will hold in suspension, by capillary attraction, six inches of liquid and the voids still contain twenty inches of air, then we have the liquid in intimate contact with three times its bulk of air. During the period of rest, through the agency of the aerobic bacteria, oxidation takes place and harmless gases and harmless nitrates are the result. When the second dosage comes on this air and this liquid are forced down into the drains underneath. After a longer or shorter period of rest, generally from 12 to 18 hours, the dose is repeated.

Some lively and profitless discussion is now being engaged in to determine who first discovered septic tank action. Patents are multiplying and various inventors are endeavoring to get injunctions on Dame Nature to prevent septic action except in apparatus of their own contriving.

The capacity will vary with the kind of material in the beds, the kind of sewage to be treated, whether the beds are divided into primary or secondary, and will be almost double in summer what it is in winter, and greater after they have been running a while than at first. Half a cubic yard in the septic tank, one cubic yard in the primary filter and one-half cubic yard

in the secondary filter ought to be ample for each inhabitant. One acre in the primary filter ought to provide for from 10,000 to 12,000 people, and one acre in the secondary filter from 20,000 to 25,000. This system would not be adapted to a city like Chicago, but is admirably suited to the average county seat town. Manchester, England, a city of 600,000 inhabitants, finds it very satisfactory. It would not be satisfactory for a combined sewer system.

In theory the durability of the septic tank would be limited only by the accumulation of the ashy or purely mineral matter in the bottom, and would be prolonged indefinitely by occasional changing. In practice this is nearly so. If rightly managed cleansing once a year ought to be sufficient. Aside from the freshly deposited matter not more than a foot of indestructible matter will be found. The filter beds, receiving only products soluble in water, will last indefinitely. It is believed they will last longer than under the older processes without the septic tank, notwithstanding a larger quantity of sewage passes through them. In some of these processes they run two years without any indication of clogging or becoming foul, and when opened the sand has been found bright and clean. They are well-nigh automatic in their working, but what little attention they do need is of the intelligent kind where brains are at a premium. A correct diagnosis is everything in relieving their troubles.

The report of the Massachusetts State Board of Health says that the effluent from some of their biological filters is freer from contamination than the Merrimac River at Lawrence, where it is pumped for domestic purposes. As a friend of mine remarked: "It tastes all right, but a mouthful quenches my thirst when I think where it comes from." Sims Woodhead of Edinburg, in his work on "Bacteria and Their Products," calls frequent attention to the inimical action one class of bacteria exerts upon another, resulting in the extinction of the one with the less favorable environment. Disease germs do not survive the disposal works. All forms have a tendency to disappear as soon as their work is accomplished and their nourishment fails. They disappear rapidly as we descend below the surface of the ground. Microscopic and biological examination of the effluent from the beds reveals very few micro-organisms of any kind. Whether they disappear or remain clinging to the gravel of the filter I do not know. This degree of purity is better obtained where both primary and secondary beds are used, the secondary approaching in size the first. It presupposes, too, abundant warmth and the absence of manufacturing concerns using chemicals that act as disinfectants hostile to these low forms of life.

MUNICIPAL MATTERS IN COURT.

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Excavated Street—The failure to replace a city street in its former safe condition after the purpose of an authorized excavation has been accomplished constitutes a nuisance. Robinson vs. Mills, 65 Pac. Rep. (Mont.) 114.

Sufficiency of Specifications—Specifications, in an ordinance authorizing city improvements, that the curbstones used should not be less than four feet long, three feet deep, and five inches thick, were sufficient. Markley vs. City of Chicago, 60 N. E. Rep. (Ill.) 512.

Notice to Receiver—Where a receiver of a water company continues employes of the company who have formerly made and negligently filled an excavation in the street, and who attempt to remedy the defect after his appointment, their knowledge of the defect, or of facts sufficient to impart notice thereof, constitutes notice to the receiver. Robinson vs. Mills, 65 Pac. Rep. (Mont.) 114.

Acceptance of Sewer—Where specifications for the construction of a sewer described the work to be done so that the street commissioner, though empowered to decide whether the contract had been performed and decide as to minor details, could not require more or accept less than the specifications required, they were not fatally indefinite. Banaz vs. Smith et al. 65 Pac. Rep. (Cal.) 309.

Repair of Sidewalk—A city is not liable for injury from a defective sidewalk, it not having had actual notice of the defect and there being no evidence from which constructive notice could be inferred, the sidewalk having been repaired 18 days before the accident, and there being no evidence as to when it again got out of repair. Rogers vs. City of Williamsport, 49 Atl. Rep. (Pa.) 293.

Release for Extras—Where a paving contractor, on receiving payment under his contract, executed a release discharging the city from all demands, except any legal claim he might have under the contract, such release was a defense to an action to recover for extras alleged to have been

done outside the terms of the contract. Grearty vs. Mayor, etc., of City of New York, 70 N. Y. Supp. 942.

Receiver's Liability—A receiver of a water company, appointed after excavation has been filled, but before the occurrence of an accident resulting from its negligence in making the fill, is liable for such injuries, though he has no notice of the defect, since the appointment cast on him the duty of repairing the street, and he is presumed to have knowledge of the defect. Robinson vs. Mills, 65 Pac. Rep. (Mont.) 114.

Mistaken Payment of Assessments—As the rule forbidding the recovery of municipal taxes voluntarily paid applies also to street assessments, property-owners who have, under mistake of law, paid assessments for street repairs for which the city alone was liable, cannot recover the amount from the city, paid by its order to the contractors. Brands et al. vs. City of Louisville, 63 S. W. Rep. (Ky.) 2.

Character of Excavation—Where, by a contract for the construction of a sewer, the contractor is to receive a fixed price for different kinds of excavation therein specified, the city's knowledge of the existence of cemented gravel in the earth, which the contractor will have to excavate, and its failure to disclose it to him, is not such a fraud as will justify the latter in abandoning the contract. Marshall et al. vs. City of San Antonio, 63 S. W. Rep. (Tex.) 138.

Grating in Sidewalk—Defendant city was liable for an injury to plaintiff from the passing of his foot through a hole in a grating forming part of a sidewalk, if the hole made the sidewalk unsafe for public use, and the city knew that fact, or could by the exercise of ordinary diligence have known it, and the plaintiff was exercising ordinary care in the ordinary use of the sidewalk. City of Henderson vs. Reed, 62 S. W. Rep. (Ky.) 1039.

Presentation of Notice—Rev. Charter Grand Rapids, tit. 4, No. 8, which is not retroactive and which requires notice of an injury arising from a defective sidewalk to be presented to the common council within sixty days, and requires suit to be brought within one year after the council has had reasonable time to investigate the claim, does not apply to a claim for injuries received before the charter went into effect. Broffee vs. city of Grand Rapids, 86 N. W. Rep. (Mich.) 400.

Obstruction of Street—Where a street was dedicated to a city and accepted by the common council, and, after a fence erected around it by defendant had been destroyed by the city highway officers, defendant erected it again and threatened to build on the property, the city was entitled to maintain a bill to restrain defendant from obstructing the street, and was not obliged to bring ejectment. City of Mt. Clemens vs. Mt. Clemens Sanitarium company, 86 N. W. Rep. (Mich.) 537.

Decision of Engineer—In a suit on a contract for the construction of a sewer, the contractors cannot complain of an instruction referring to the finality of the decision of the consulting engineer and public improvement committee as to the classification of material excavated on the ground that there was no provision in the contract requiring submission of any dispute to such parties, where they submitted the question to them for decision. Marshall et. al. vs. city of San Antonio, 63 S. W. Rep. (Tex.) 138.

Engineer's Certificate—Where a paving contractor had taken up and relaid certain paving under the direction of the engineer having supervision of the work, he was not entitled to maintain an action against the city for extra compensation on the ground that he had been wrongfully compelled to relay the pavement after he had accepted the engineer's certificate and received payment thereunder. Gearty vs. Mayor, etc., of City of New York, 70 N. Y. Supp. 942.

Notice of Defective Street—Where a street railroad track which had been abandoned was covered with gravel, but the rails subsequently became exposed, whereby plaintiff was injured in driving along the street, the questions of negligence on the part of defendants, city and street railway company, and of contributory negligence on the part of the plaintiff, were for the jury; the defect in the street having existed so long that defendants were chargeable with notice thereof. Paducah Ry. & Light Co. et al. vs. Ledsinger, 63 S. W. Rep. (Ky.) 11.

Dangerous Ditch.—The owner of a ditch, which is upon a public street in a city, is under obligation to keep it in such condition as the safety of persons traveling upon the street and exercising reasonable care to avoid danger, demand; and the failure to keep same in such safe condition is negligence, and renders the owner liable to damages for personal injuries resulting from such condition, in case the injured parties are not guilty of contributory negligence. Horn et ux. vs. Boise City Canal Co., 65 Pac. Rep. (Idaho) 145.

Speed Ordinance—Where, in an action for injuries, alleged to have been received by reason of defects in one of defendant city's streets, there was evidence to show that plaintiff was driving at a greater speed han six miles per hour, Ordinance 136, secs. 1 and 10, forbidding driving at a speed greater than six miles per hour, and providing that a violation of the ordinance shall be a misdemeanor, was admissible to show contributory negligence. Herries vs. City of Waterloo, 86 N. W. Rep. (Iowa) 306.

Delayed Paving—Where a paving con-

tract provided that a certain board of commissioners should be the judges of the time which the work was unnecessarily delayed, and should certify the same for deduction, the contractor was not entitled to recover from the municipality for delays alleged to have been erroneously charged against him in the certificate, in the absence of a demand on the board to have such charges for delay removed by them. Gearty vs. Mayor, etc., of the City of New York, 70 N. Y. Supp. 942.

Construction Pursuant to Ordinance—In an action against a city for damages to abutting property, caused by the construction of a viaduct on a street in front of it, it is no defense that the viaduct was constructed under an order of the city council, when it should have been done in pursuance of an ordinance, since the improvement was within the authority of the defendant, and any irregular or defective exercise of the power would be no protection to the city. City of Chicago vs. Spoor et al., 60 N. E. Rep. (Ill.) 540.

Public Cisterns—Ky. St. Sec. 2,833—a part of charter of cities of the first class—authorizing the general council to construct public cisterns "and to apportion the cost thereof exclusively against the owners of lots fronting the public ways to the middle of each square from the intersection at or near which the work shall be located according to the number of square feet in such lots, or in any other equitable mode of apportionment which the general council may prescribe by ordinance," is not unconstitutional. Abraham et al. vs. City of Louisville, 62 S. W. Rep. (Ky.) 1041.

New Assessment—Where city improvements were made under a valid ordinance properly specifying the nature, locality and description of the improvements, and the first assessment therefor failed because the cost thereof was not estimated by the commissioners named in the ordinance, an assessment under a supplemental ordinance reciting that the improvements were completed in accordance with the original ordinance was not defective because the ordinance did not repeat the description of the improvements. Markley vs. City of Chicago, 60 N. E. Rep. (Ill.) 512.

Indefinite Street Work Resolution—A resolution of intention to perform street work, prescribing that a certain avenue "be graded for its full width to the official lines and grade, curbed, guttered and macadamized," and also prescribing certain cross walks and a gutter, said work to be done "in accordance with the special specifications adopted for said work by said board on the day the resolution was adopted," was not sufficiently definite to authorize a contract for such work, and the contractor, having performed it, had no lien therefor on the property benefited. Bay Rock Co. vs. Bell et al., 65 Pac. Rep. (Cal.) 299.

Limited Indebtedness—Where bonds for improvement of a street are issued under Act May 23, 1889, art. 15, sec. 17, to be paid from assessments, Const. art. 9, sec. 8, providing that municipal indebtedness shall not be increased beyond a certain amount without assent of the electors given at an election, does not prevent the city being liable on the bonds, the assessments being invalid because of irregularity in passage of the ordinance, there being no intention when the bonds were issued that the indebtedness should be thereby increased. Gable et al. vs. City of Altoona et al., 49 At. Rep. (Pa.) 367.

Opening Street—On the opening of an avenue a strip of land ten feet by four was left in front of an owner formerly abutting on a street to which the city had no title, and which was not a continuous thoroughfare. Over such strip of land the abutting owner had the same easements as the public. The commissioners of estimate and assessment awarded him damages for change of grade. Held, that in assessing it for benefits they could consider the benefit derived by the property from fronting on an avenue which is a continuous thoroughfare. In re Grant-ave., 70 N. Y. Supp. 1045.

CURRENT INFORMATION.

St. Joseph's Board of Public Works Law Unconstitutional.

In an opinion handed down by Judge Brace, June 20, the Missouri Supreme Court declared the board of public works law, passed by the last legislature, to be unconstitutional, and affirmed the judgment of the circuit court of Buchanan county sustaining a demurrer to the petition. The court says:

By section 7, article 9, of the constitution, is is provided that the General Assembly shall provide general laws for the organization and classification of cities and towns. The number of such classes shall not exceed four, and the power of each class shall be defined by the general laws so that all such municipal corporations of the same class shall possess the same powers and be subject to the same conditions.

By section 53, article 4, the General Assembly is prohibited from passing any special laws changing the charter of cities, or a local special law where a general law

can be made applicable, and no bill shall contain more than one subject, which shall be clearly expressed in its title.

The general law for classification of cities is then quoted, after which the court continues:

That the act in question was intended to apply to the city of St. Joseph is beyond dispute. There is no other city in the state to which it could apply. By it, under the guise of a general law, a special law is, in fact, provided for that city, in disregard of the inhibitions of the constitution as to special laws for particular cities, and of the principle of uniformity in the laws of cities of the same class, which it was the purpose of the constitution to have, and which by the general law aforesaid has been established in the state. The guise under which this result is sought to be accomplished, while it may give to the law the appearance of a general law, does not conceal its real character, and by creating an additional class of cities to which it is applicable, renders it obnoxious to the provisions of the constitution, which limits the power of the legislature to the creation of four classes.

By such legislation as this, if upheld, the constitutional provisions in this regard would be rendered nugatory, and special and variant laws might be enacted for the government of most of the cities of the state. All that would be necessary for the accomplishment of that end would be to select a maximum and a minimum number, within which is comprised the population of the city for which the special law is desired, which will create a class regardless of the class to which it really belongs, and make the law applicable to such newly created class. And thus we might have almost as many classes as there are cities in the state, all governed by different and various laws, instead of only four classes, governed by laws uniform for each class, as contemplated by the constitution.

But this law is not only vicious in this respect, but it has another fatal defect—it palpably violates the last constitutional provision cited, which requires that no bill shall contain more than one subject, which shall be clearly expressed in the title. The subject as expressed in the title is "An act creating a board of public works in cities of 100,000 to 150,000 population." Of the act are three sections, 5, 12 and 13, governing cities of the second class, materially affecting their interests and changing the general laws under which they are incorporated, and section 17, predicating an emergency upon the fact of the near approach of the election of city officers for that class, although cities of that class are not mentioned or even hinted at in the title of the act, and no one could have inferred from that that they were included in its legislation.

Thus uniting in the same act two separate and independent subjects, one of which is not expressed in the title thereof, and bringing it clearly within the inhibition of the constitution, the act contains no repealing clauses and is otherwise incongruous and absurd, but as it is so obviously obnoxious to the constitutional provisions cited, further comment is unnecessary. The circuit court committed no error in sustaining the demurrer to the returns, and its judgment is therefore affirmed.

No City Engineer Can Be Legally Provided for St. Joseph, Mo.

The Missouri supreme court rendered a decision June 29 holding that the last legislature, in repealing section 5,537 of the revised statutes, did away with the office of city engineer and provided for the office of city controller for St. Joseph. No provision for city engineer was made, but it provided for such officer under a board of public works law, which it enacted, and which the supreme court declares unconstitutional; therefore, there is no statute authorizing the office of city engineer for St. Joseph. The opinion says:

It may be that if the office is still extant the respondent would be the legal incumbent thereof, no successor to him having been legally appointed. But how he can be the legal incumbent of an office created by statute when the statute creating it has been expressly repealed, it is difficult to see.

The courts have no power to reform legislation. As it comes from the hands of the legislature so we must take it, good or bad, perfect or imperfect, and however much we may regret the unfortunate situation in which this legislation leaves cities of the second class in regard to one of the most important departments of municipal government, it is beyond our power to relieve. The court erred in sustaining the demurrer to the return, and for this error the judgment will be reversed and the cause remanded. All concur.

California Municipal Improvements Seriously Delayed by a Court Decision.

The following from City Engineer Frost of Petaluma, Cal., gives the statement of the effect of the recent supreme court decision in that state on the proper time for presentation of specifications for work:

I expected to report an award of contract for the construction of about 7,500 feet of six and eight-inch pipe sewers, for which bids were asked on the first of this month, but within a few days our supreme court has knocked a hole in the California street law big enough to drive a horse and cart through.

The proceedings under the street law are as follows: First, the board of trustees passed a "resolution of intention" to do work, stating just what was to be done. This was published for two days, and in twenty-six days thereafter, if there was no protest, the board had acquired jurisdiction to order the work. Then the board passed a "resolution for construction" directing the clerk to advertise for bids.

The law says plainly that "before passing any resolution for construction of said improvements plans and specifications and careful estimates of the cost and expenses thereof shall be furnished," etc.

For sixteen years it has been the custom to adopt the specifications after the resolution of intention, and before the resolution for construction. Now comes the supreme court, after all these years, and

says that the specifications must form a part of the resolution of intention, otherwise the assessment is invalid and the contractor cannot collect a cent This will cause a loss to California contractors of thousands of dollars for work that has already been done in good faith, and they have no remedy, for the municipality has no responsibility whatever under the law. In our own case we were about to contract for about $4,000 worth of sewer work. But for unforeseen delays last spring these contracts would have been let several weeks ago and the work well on toward completion. The consequence would have been that the contractor would have lost every dollar he invested. It would have been the same if the decision had been handed down a little later, but the contractors got word in time and all of the bids that were submitted last night were withdrawn before the meeting of the board.

For the last two years contractors have been shy of bidding for work under the law, and only within the last few months have any of our local men been willing to take hold. This of course will give us another backset, and I don t suppose that we will be able to do any more work this year at least.

Illinois City Debt Limit Cannot Be Evaded by Pledging Water Receipts.

A decision was rendered July 8 by Judge Dibell of the Wills county circuit court in which he denied the city of Joliet, Ills., the right to enlarge its system of water works by pledging the water receipts. The decision affects all municipalities acting under the water works improvement law passed by the legislature of 1899. The bill provided a means whereby cities already bonded to the legal limit might improve their water supplies by issuing water certificates against the earnings of the water department without regard to the bonded indebtedness of the municipality. Under this law several cities have expended several thousand dollars in improving their water supply, and the water certificates charged up against the earnings of the water department are held by Chicago bond dealers.

The city of Joliet, already bonded to the legal 5 per cent. limit, undertook to improve the water supply under the new law. The council authorized the improvement at a cost not to exceed $240,000, to be paid out of the earnings of the water department, against which the special certificates were to be issued. Contractors were unwilling to bid on the specifications, however, and no bids were received. The contractors desired a supreme court decision upon the constitutionality of the law, and bond dealers, becoming worried over the soundness of the law, refused to take any more certificates from the contractors. Charles O. Wood of Chicago, the author of the bill, offered to take up a test case for the city, and an injunction restraining the city from entering into this contract was petitioned for, and upon this petition Judge Dibell made his ruling. In rendering his decision Judge Dibell said:

The sole question is whether if the city proceeds under said statute and ordinance to enter into a contract for the enlargement and improvement of its water works system, and issues such certificates and secures them by such mortgage, an indebtedness of the city will thereby be created within the meaning of the constitutional restriction of 5 per cent. That an indebtedness will be created is obvious. The statute calls such "certificates of indebtedness." Who will owe that debt? It cannot be said it is the debt of the future consumers of the water. They will owe for what water they consume, but not for the cost of enlarging the water works system. They will owe that debt to the city only and not to the holders of the certificates. The city now owns a water works system. It is to mortgage the use of that property for an indefinite number of years in the future to secure the payment of the certificates.

The bill charges the city is now receiving an income of $2,000 per annum from its present system, over and above the cost of operating it, and that this net income will be largely increased by the new rates established by said ordinance, which rates are to go into force on Aug. 1, 1901. This net income from the present system is an asset of the city. It is to be pledged for the payment of said certificates. If the price proposed to be paid for said improvement will not be a debt of the city, the court is unable to see by what authority the city can mortgage its present property and pledge its present income to secure the payment therof.

It is clear the cost of the enlargement and extension of the water works system at the price at which the contract therefor may be let, not exceeding the sum of $240,000, is to be paid by the city in future years. The only difference between this and any ordinary contract which the city might make for the enlargement of its water works system on credit is that it is the intent of the ordinance, though not as fully expressed as it might have been, that the payment shall be made only out of the income to be derived by the city from supplying the public with water through said system at the rates prescribed, and that no other funds of the city are to be resorted to for such payment.

A distinction is sought to be drawn between an indebtedness contracted by the city in exercising its functions of government and an indebtedness contracted by it in a commercial transaction, such as the sale and delivery of water to consumers. The constitution does not recognize the distinction, but forbids a city to become indebted beyond the 5 per cent. limit, "in any manner or for any purpose," a restriction as comprehensive as words can express. Our Supreme Court has always manifested a purpose to enforce this constitutional provision in accordance with its obvious intent and meaning. It seems clear to this

court that the city of Joliet is seeking to avoid the limitations of the constitution. Being already indebted beyond the limit prescribed, it proposes to contract for the enlargement of its water works system at a cost of $240,000, and to pay said cost in future years out of its assets, but argues that because it is to contract to pay therefor only out of certain particular assets, instead of agreeing to pay generally out of any and all of its sources of revenue, therefore it is not creating a debt. In the opinion of the court the distinction is not real. If established, it will open the way to other methods of going in debt beyond the prescribed limit.

If the city should hereafter reduce its indebtedness below the prescribed limit, no reason now appears why it might not proceed under the ordinance to improve its water works system, so long as it did not thereby carry its total debt beyond 5 per cent. of its taxable property as ascertained by the last assessment.

The city should be enjoined from making any such contract and issuing any such certificates and mortgage at the present, and at any future time when the price and cost thereof, or any amount of such certificates, added to the other debt of the city, will exceed the 5 per cent. limit.

The Best Source of Information on Municipal Subjects.

It has been said of Municipal Engineering Magazine that its volumes constitute the best existing library on subjects relating to municipal affairs. Many readers, when in search of information on such subjects, have found this to be the case. A letter from Mr. N. S. Frost, city engineer of Petaluma, Cal., under date of July 2, is an instance. The letter is as follows: "The question of filtering of the water supply came up a few days ago in the board of health (of which I am a member) and referring to my file of Municipal Engineering (three volumes only) I found twenty-one articles on the subject, of which five gave me the information I wanted. I also had occasion to write an article for our local paper on the waste of water and found five articles on that subject, from which I compiled a column article which attracted a good deal of attention from both the water company and the consumers. All of my data I found in your magazine."

Public Work in Cincinnati, O.

The forty-fourth annual report of the engineering department of Cincinnati, Ohio, for 1900, has been filed by Chief Engineer Stanley. The report shows the improvements in contemplation for 1901 will exceed in cost $300,000, while those now in process will cost about $600,000.

The extension of the electric subway system will afford a large amount of work for the engineering department, as it will involve the opening and replacing of many miles of asphalt, granite and other improved streets. The traction company will lay about thirty miles of track, which will also give the department a great amount of work. The sewerage system of the city is largely the combined system, storm water and sewage occupying the same conduit, and the discharge is all into the Ohio or its tributary streams, some quite remote from the river, thus necessitating long distance flows in open creeks. Chief Engineer Stanley hopes that some system will be devised for the disposal of sewage in large quantities, other than discharged into streams. This, he says, has not yet been satisfactorily accomplished, and the Ohio will continue to be for some years the depository for the sewage of the city. An intercepting sewer for Mill creek territory has been planned, which is designed of sufficient size and depth to intercept all the sewage from both sides of the creek as far north as Glendale, permitting the storm water to flow into the creek, as it now does. This sewer, when built, will relieve Mill creek of sewage pollution.

Railway Franchises Taxable as Real Estate in New Jersey.

The New Jersey supreme court rendered a decision recently, holding that railway franchises in New Jersey are taxable as real estate. The decision affects every city, township and borough through which an electric trolley road passes and will result in giving several million dollars annually to the state revenues. It is believed, however, that it may prevent the construction of several small trolley lines for which franchises have already been granted.

Conflicting Decisions in Wisconsin on Liability of City for Invalid Special Assessments.

A decision has been rendered by Judge Vinje of the circuit court, West Superior, Wis., who holds that sewer certificates cannot be held against the city, and that the city is not responsible for them when the taxes have not been paid.

The decision was rendered in the cases of L. R. Rotle and the Rich Sewer Pipe company. Both firms held sewer certificates that were issued for the building of a sewer which was built without a petition from the property-owners. The certificates were issued during the progress of building the sewer, and the tax-payers commenced suit to have the assessment set aside, as they had not asked for the sewer. The court decided in favor of the tax-payers. The contractors then tried to hold the city responsible. Judge Vinje held that the city

cannot be held; also that in the case of a street improvement, under similar circumstances, the city would not be held responsible for the certificates.

The decision is in direct opposition to that of the supreme court, which rules that in case of failure to pay taxes the city is stll responsible for bonds that have been issued.

Suburban Roads Must Enter Cincinnati Under Street Railroad Requirements.

In order to get to the center of the city suburban railroads, adjudged by court to be street railways, must enter as street railways, obtaining consent from the property holders or else by some arrangement with the Cincinnati Traction company, according to a ruling made by Judge Ferris July 6 at Cincinnati, O. Powell Crosley has been seeking to obtain permission to lay tracks on the streets of the city of Cincinnati, condemning property to do so, much the same as the ordinary railroad company. Mr. Crosley first made application to the board of legislation for a franchise over 6¼ miles of street about four months ago. The matter was referred to a sub-committee, but Mr. Crosley later withdrew the application and applied to the Probate Court, which was his option. In rendering his decision Judge Ferris covered the following points: He found that a railroad company, under the laws of Ohio, had the clear right to obtain title by appropriation of a street for crossings or for entrance to a city in reaching its terminal point; that the right of appropriation, under the law, did not exist in a street railroad—in this he followed his own decision in the inclined plane case, known as the Main-st. case, in which he denied to that company the right to obtain by appropriation title to Main-st. and other streets occupied by the company.

The decision also goes to the effect that the policy of the law, as laid down by the Supreme Court, does not favor the taking of streets longitudinally; that the use of streets in such a manner amounts to practically an exclusive use, and is, therefore, contrary to the very object for which streets are in existence; that the public interests, as well as the interest of private individuals, demand that no such burden shall be placed upon the streets as will exclude other and proper uses of streets; that title to the streets of the city is wisely left to the city authorities, who, in law, have the care and control of all streets for street purposes, and that the adding of any additional burden to the ordinary one is not only zealously guarded by the law, but is tolerated only when the interests of the case require it.

The court, therefore, finding that the entire trackage of the company was to be laid upon the public streets, upon thoroughfares that are narrow in some instances and illy provided to serve existing conditions, denied the necessity of the appropriation and refused to grant the application.

Results of Brick Tests in Toledo.

The report of Engineer Tonson of Toledo, O., on the paving brick test was submitted at the meeting of the streets committee of council, July 11. He reported that he had tested every kind of brick of which he could receive enough samples to make the test of any value, in two ways—the absorption and abrasion tests. The absorption test was accomplished by immersion three days and the abrasion test by a rattler. The engineer's report showed the following result:

Name.	Loss by Rattler.	Absorption.
Athens	.06	.0143
Massillon	.102	.0242
Metropolitan	.065	.0121
Harris Pavers	.123	.0236
Logan	.131	.0262
Canton	.084	.00653
Trimble	.18	.00585
Buckeye	.133	.0350
Townsend	.10	.00992
Bolen's Brown Granite	.118	.00734
Perkins	.099	.0187
Medal	.114	.0387
Nelsonville	.08	.0087
Portsmouth	.127	.0017
Lane	.049	.0131
Kentucky	.076	.0091
Twentieth Century	.069	.0109
Lorain	.137	.0169
Hallwood	.104	.00571
Mack	.097	.0448
Wassall	.126	.0253
Iron Rock	.097	.0233

Engineer Tonson stated that the test as made might not be conclusive.

Steam Heated Sidewalks.

Steam heated sidewalks are proposed by the University of Chicago. The old walks which lead from the women's halls to the lecture rooms in Cobb hall are being torn up preparatory to putting in the pipes, which are to protect from rain and snow the cement walks that are to replace the old wooden pathways. An elaborate system of brick sewers will be built from one end of the campus to the other, wherever the sidewalks run which lead to the various halls and laboratories. The steam pipes will be built in connection with these sewers. They will radiate from the central power plant to be built on the east side of the campus, and will supply heat and light to the various buildings. The heating and sewerage systems will be hidden from view by the cement walks, which will be kept at a moderate temperature in cold weather by the heat of the steam pipes underneath.

Cement Walks Expanded by Heat.

The continued hot weather has caused the granitoid walks in several streets in Kansas City, Mo., to expand. Not enough space was allowed on S. Montgall-ave., and two of the sidewalk blocks "buckled," rising eight inches above the level of the rest of the walk. In some of the walks in the North park district the expansion of the walk broke the granitoid curbing and forced it into the street. A similar buckling of two small blocks of poorly laid cement walk was observed in Indianapolis.

Development of the Kentucky Asphalt Deposits.

New developments in connection with the deposits of asphalt rock in central western Kentucky are impending. There seem to be great possibilities in the enterprise, and material modification of the business of laying asphalt streets may result. Quietly certain strong interests have aggregated into one organization the separate holdings of almost the entire number of the deposits of asphalt rock and now state that they are prepared for effective work and active operation on a large scale.

There are about ninety different deposits in the state of Kentucky, ranging in size from five acres to 500, situated in the counties of Edmonson, Grayson and Hardin, with a few in the adjoining counties. The section of country in which the deposits occur is somewhat irregular in shape, but is about thirty miles long and probably ten miles in its greatest width. The asphalt rock is called by the natives "black rock" and is found in ledges of sandstone in the upper formations and only on the higher plains and hills. It has not been found excepting in the peculiar geological formation of this section of the state.

The rock contains asphalt of pure quality, entirely free from organic matter, the only other constituent of the rock being white quartz sand. The percentage of asphalt in the rock varies from four to eighteen. The principal claims are: That the particles of sand cannot be so completely covered and joined together in an artificial mixture as they are in nature; that the asphalt rock is free from clay, vegetation and other organic matter and does not require the addition of petroleum oils, sand and limestone to make a paving material; that genuine asphalt rock has existed unchanged for indefinite time and pavements made of it are unchangeable with time and with temperatures of summer or winter.

OUT CROP OF NATURAL ASPHALT ROCK IN KENTUCKY.

The location of these deposits is in the heart of the central part of the state, having railroads crossing it, giving transportation by rail from the mines to every city in the country, and having navigable intersecting rivers giving water transportation to the cities on the Mississippi, Missouri and Ohio rivers and their tributaries. The facilities for distribution of the material are thus practically unequaled.

The crude asphalt rock has been crushed and laid as a pavement, but thus laid it usually proves too soft at least for the first summer. Recognizing the initial softness of asphalt work and its disadvantages to the public, the practical scientists engaged in the work have developed a special process to which the crude rock is subjected in the works at the mine, which is claimed to remove the difficulty. The material thus prepared is shipped to the place of use and can be laid, it is said, without skilled labor or expensive plant. Should this claim be established many small cities, towns, corporations and individuals, who have heretofore been barred from the advantages of asphalt work because it was not of sufficient magnitude to justify the large expense required for a mixing plant, can avail themselves of the benefits of this class of pavements. These features of what promises to become an important factor in the paving business will be of interest to many of our readers and we are advised that, to those who desire it, further information will be furnished by the promoters.

Front Foot Assessments Valid.

The United States supreme court, in French vs. Barber Asphalt Paving company, says that it cannot be said that the case of Norwood vs. Baker established the principle that the cost of a local improvement cannot be assessed against abutting property according to frontage, unless the law under which the improvement is made provides for a preliminary hearing. That case was exceptional as has been explained in previous numbers. The court holds that an orderly procedure under a scheme of local improvements prescribed by the legislature and approved by the courts of a state as consistent with constitutional principles whereby the cost of a pavement is apportioned and charged against the lots fronting thereon according to their frontage on the improvement is not a taking of private property for public use without due process of law contrary to the fourteenth amendment of the constitution of the United States and is not illegal under the decision in Norwood vs. Baker.

Lime Water for Street Sprinkling.

In an English medical journal a correspondent suggests that the use of lime water, prepared fresh, for watering the streets in hot weather would prove to be a practice productive of sanitary comfort. The advantages claimed for this practice are said to be those first of aggregating together loose particles of manure and thus to prevent them being diffused by the wind; second, of exercising a certain antiseptic action; third, of preserving wood paving; and fourth, of rendering wood less slippery. A contemporary thinks that the idea should be worth considering by the local authorities entrusted with the care of the streets, and that an energetic surveyor might make a trial of that plan on an experimental basis.

The question which arises is whether the small amount of lime carried by the water would have any appreciable effect. Many water supplies are already supplied with lime almost to the limit of saturation, and a few use softening processes, but no noticeable sanitary advantage has been reported from these towns.

Cracking of Cement Briquettes and Surfaces.

In a discussion at a meeting of the Engineers' club of Toronto on the subject of specifications for cement, Mr. M. J. Butler, formerly connected with a prominent cement factory in Canada, described his method of making tests for constancy of volume of cement:

First select a small strip of plain glass, about 3 inches by 1½ inches, wash it clean; mix the cement neat, working it up into a stiff mortar, trowelling it well on the glass. the briquette will be about half an inch high in the center and be worked off to a knife edge at the edges of the glass, forming a flattened pyramid. All the air should be worked out with the trowel, and all surplus water. Spend time enough to do the work well. Cover with a damp cloth to preserve the sample from drying out; leave in the air until set, generally twelve hours; then place in a damp atmosphere or vapor over hot water in the hot bath tank—water heated to 130 degrees F., where it should remain for twelve hours longer. Then place in the hot water and steam it for twenty-four or thirty-six hours. If a new untried cement raise the temperature gradually up to 170 degrees F. If the sample remains true and straight and free from cracks there is no free lime present in a form that will injure the cement or mortar. Sometimes it is found that although the sample is hard, strong and breaks with a sharp ring as it should, it breaks the glass—and an explanation was asked as to why this should be. It is suggested that the sample generally is lying around for some time exposed to varying temperatures, the chances are the glass is a very hard piece, and one slightly porous and roughened, so that the briquette adheres very strongly to it. Now the co-efficient of lineal expansion of pure Portland cement is for one degree Fahrenheit, 0.0000594, and for glass of the kind above assumed, 0.0000397; in other words, and neglecting the cubical effect of the greater mass of concrete—the expansion of the concrete for a given change of temperature is probably twice that of the glass. This explanation also suggests the reason why sound cements quite frequently leave the glass altogether. Care should be taken in examining briquettes to distinguish between expansion cracks due to free lime and those some-

times witnessed due to mere drying out, or insufficient trowelling.

With regard to hair cracks and shrinkage cracks, Portland cement mortar exposed to air diminishes in volume. If drying takes place gradually no defects will appear, but if allowed to dry rapidly, or in a draught of air, or in sunshine without taking the precaution to keep it moist, the so-called shrinkage crack appears. Hair cracks as seen on pavements and piers are generally, if not always, due to using too rich a mortar, and are caused as above described. The remedy is to use more sand for such surface work.

Under ordinary temperatures cement is unaffected by extremes of heat and cold to any appreciable degree; a good cement will stand boiling water; but in extreme cold chemical action is suspended, but between the freezing point of mortar and say a temperature of 400 to 500 degrees Fahrenheit, cement mortar will behave in the ordinary way—higher temperature accelerating the set of the mortar, lower temperature retarding it. At extreme high temperatures he believed Portland cement concrete will disintegrate and fly to pieces, particularly if drenched with water; hence he regarded it as an unsuitable material for fire-proof buildings.

The Setting of Portland Cement.

In an article on the subject, "The Setting of Portland Cement," Mr. G. J. Burns describes the process of setting as follows:

In order to watch the process of setting cement may be dusted on a slide, an ordinary cover glass placed over it and fastened down, and the whole put into a dish of water. On examining the slide with a power of about 200 from time to time, it will be found that the grains of cement become covered with tufts of acicular crystals, which begin to make their appearance, sometimes in half an hour, sometimes not for two days. The crystals are much too minute for their form to be observed, but they appear to be of uniform width, so may be assumed to be prismatic. The crystals appear to grow only in length, the width remaining constant. The greatest length observed is 0.002 inch. The width is too small to be measured with the powers used, but is probably under 0.0001 inch. The tufts of crystals generally spring from angles or prominences on the grains of cement.

Specifications for Bituminous Concrete Sidewalks, Crossings and Gutters.

The following are the specifications for the materials and methods of construction of bituminous concrete sidewalks, with the modifications required for street crossings and gutters, using straight run gas works tar, according to the principles set forth by F. J. Warren in his articles on bituminous concrete in preceding numbers of Municipal Engineering:

Materials—The materials used for concrete will be coarse, clean, gravel or crushed stone, clean screened, sharp sand or stone dust, the best quality of coal tar, containing original oils, and coal tar distillate free from all petroleum compounds or water, and the whole mixed in proportions to make the best quality durable concrete.

Under the terms of this specification tar shall be construed to mean straight run gas works coal tar, which contains not to exceed 25 per cent. of its weight to be removed in order to make a standard roofing pitch. Water gas tar, process tar, or coke oven tar shall be excluded from use under these specification and only the best quality of straight run coal tar or coal tar cements will be used; cut back pitches or cements will be excluded.

The paving composition, or tar composition, required, shall not be produced by the mixture of tar and pitch, but shall be produced by direct distillation of a good quality of gas works coal tar, arriving at the consistency of flexibility required for the particular purpose.

The bituminous cement used in the preparation of driveways, cross-walks and gutters, shall be of such a consistency that it will not become brittle when made into a roll 4 inches long and ½ inch in diameter to such an extent that it will break when bent double at a temperature of 32 degrees Fahrenheit.

The bituminous cement used in the preparation of the sidewalk wearing surface shall be of such a consistency that it will not become brittle when made into a roll 4 inches long and ½ inch in diameter to such an extent that it will break when bent double at a temperature of zero Fahrenheit.

No mixture of crude coal tar and coal tar pitch will be permitted to be used in the wearing surface of the sidewalk, and all cements which develop too large a proportion of volatile oil or have too short a range of flexibility at atmospheric temperatures may be excluded upon order.

For cross-walks, gutters or driveway surfaces the cements used shall be harder and may be prepared by mixing the sidewalk cement with relatively soft pitch. No crude tar will be permitted in any part of the wearing surface.

By these specifications it is intended to permit only the use of the best grades of coal tar materials.

Construction—All work is to consist of three classes of material:

1. A foundation of cobbles or broken stone and coal tar.
2. A binding course of fine gravel and tar composition.
3. A wearing surface of sand and tar composition.

Each layer to be thoroughly consolidated and rolled separately.

The foundation course to consist of coarse gravel, crushed stone or slag, 2½ inches to 4 inches in greatest diameter according to the class of work, coated with hot crude coal tar before delivering on the work and spread evenly and well tamped and rolled until the stones cease to creep under the roller.

The binding course to consist of clean screened gravel or crushed stone not exceeding 1 inch in diameter, heated or dried to such an extent and so mixed while warm with hot coal tar as to thoroughly and completely coat every part of it, and warm

enough so that it will work easily with a rake; the material to be spread w ile fresh over the foundation course to such a depth that it will fill all the voids and produce a uniform, level surface.

The wearing surface to be composed of clean screened, sharp sand or stone dust of such size as shall be approved, the sand to be thoroughly heated and mixed with coal tar composition as previously specified. The sand shall be heated to the lowest possible temperature which will make it work freely with such cement, and the mixture shall be so prepared that it will yield on analysis between the limits of 7½ per cent. and 10 per cent. of pure bitumen soluble in coal tar benzole, and the sand and stone dust shall be of such size that none of it will stand on a ¾-inch mesh sieve, and at least 3 per cent. shall pass through a sieve with 200 meshes to the linear inch. Not to exceed 40 per cent. of the sand or mineral grain shall stand on a sieve with 10 meshes to the linear inch. This mixture to be spread while hot over the binding course in an even layer and thoroughly compressed before cooling. The surface will then be sprinkled with fine sand or hydraulic cement well rolled in.

The above mixture contemplates the use of from 25 per cent. to 40 per cent. of commercial composition, by measure, the amount to vary according to the relative purity in bitumen of the composition.

For sidewalks the gravel must not be over 2½ inches greatest diameter. The foundation course and the binding course together are to be rolled down to a thickness of 2½ inches and the top course is to be at least ½ inch thick, making a minimum thickness of 3 inches.

For street crossings the first course of foundation is of cobblestones not more than 4 inches greatest diameter, mixed with coal tar, and the second course of foundation of gravel or stone not more than 2½ inches in diameter and coated with coal tar, the two courses being rolled down to a thickness of not less than 4 inches. One gallon of hot pitch to the square yard is to be poured on top of the second course. The binding course is applied to form a uniform surface and the wearing surface on top must roll down to a thickness of not less than 1 inch, making a total thickness of not less than 4 inches.

Gutters will be 6 inches thick, in 5 courses, the last a wearing surface of 1½ inches. More pitch will be used in the mixtures to make a harder surface.

Report on Proposed New Water Supply for Sacramento.

In his report to the Citizens' Water Investigation Committee of Sacramento, Cal., Rudolph Hering of New York City says that there are only two sources to consider for a water supply for that city—the river water properly filtered and the East Side well supply. These two sources he considers carefully as to quantity, quality and cost. As to quantity he says the river supply is beyond question, but he believes the well supply would prove ample for the city's use. As to quality he holds that each, under the methods suggested, would be equally free from bacteria and disease germs, while the river water is a little sweeter and softer, yet the well water is much softer than the water usually used for municipal purposes. He estimates that, in the matter of cost, after allowing for depreciation in plant, interest on investment, etc., the cost of operation of the river filtration plant would be, for 6,000,000 gallons per day, $15,000 per annum in excess of the cost of delivery from the East Side wells, while for 10,000,000 gallons daily the difference would be about $23,000.

Serious Damage from Electrolysis in St. Louis.

The damage to mains, pipes and metallic contrivances by electrolysis is becoming so much of a nuisance in St. Louis, Mo., that steps must be taken to protect property, according to B. C. Adkins, chief engineer of the water works distribution system of that city. W. E. Rolfe, engineer, has a collection of speciments in Water Commissioner Flad's office, one of which, a 6-inch cast-iron water pipe, is so brittle that it can be sliced with a knife, and a common nail driven into it with ease. Another specimen is a brittle fire plug draw bolt, made of wrought iron. The current almost cut the bar in half, making it a soft strip of grained carbon. Samples of electrolytic action on lead pipe are also exhibited.

The underground pipes of Leavenworth, Kas., are also being destroyed by electrolysis.

Water Company Cannot Refuse to Supply City with Water in Ohio.

A decision was handed down in the circuit court recently in the water works litigation at Urbana, O., affirming the decision of the common pleas court. The common pleas court held that a water works company is a quasi public corporation, and that so long as it continues to use the streets of the city for the purpose of supplying water to private consumers it cannot dismantle its hydrants, or refuse to supply the city with water for fire protection, even though there is no existing contract. The decision, which is the first of the kind rendered in the state of Ohio, is regarded as important to municipalities and water companies.

Regulation of Water Charges by Court in Arkansas.

A decision was handed down in the Pulaski chancery court at Little Rock, Ark., July 11, by Chancellor Thomas B. Martin in the suit of W. L. Baker vs. the Home Water company. The plaintiff, who refused to pay for water for sprinkling purposes during the winter months, instituted suit February 13, 1900, asking for an injunction

restraining the water company from cutting off the water on his premises. A temporary restraining order was granted at that time. The water company claimed that under its charter it was entitled to charge $10 for the year for sprinkling instead of 83 1-3 cents per month for the months in which the water is actually used.

The court refused to grant the injunction because the plaintiff had not given the company notice to cut off the water, and because his hydrant was not so fixed that he could turn the water off and still use it for domestic purposes.

Chancellor Martin held, however, that the water company had no right to collect for more than one month's water service in advance, and then only for water actually used. A synopsis of the opinion is as follows:

It is the duty of the water consumer at his expense to so construct his water fixtures that he will pay for only such water as he may use, and that if he had his lawn hydrant and fixtures in the house all so connected with the service pipe and refused to pay for all the fixtures that could be thus used, the water company had the right to cut off the water; but that if he would so construct his fixtures that only certain of them could be used, and the water cut off from the others, he would only be required to pay for such as could be used; that the water company has no right to require more than a month's pay in advance for lawn hydrants at the rate fixed in the ordinance, and for the months actually used; that those who use water for lawn purposes have the right to use all that may be necessary, but will not be allowed to let the hydrant run all night, making a useless waste of water.

Beneficial Effect of Water Meters in Asbury Park.

In his report to the city council of Asbury Park, N. J., July 8, John L. Coffin, superintendent of the water department, showed that the installation of water meters had effected a saving equal to a 45 per cent. increase in the water plant, and that there was now no danger of a water famine. The present surplus per day represents at least 400,000 gallons, and Superintendent Coffin estimates that with the present facilities and the use of meters Asbury Park has water supply enough for at least fifteen years.

Mr. Coffin's ability in the management of the water department is commented upon editorially in the Daily Spray of Asbury Park as follows:

When John L. Coffin was appointed superintendent of the water department something over a year ago there were a few who deprecated that a change had been made in the management of the plant. The wisdom of the change has been apparent since the first day that Mr. Coffin assumed the duties of his new office. He has brought the Asbury Park water department to a state of efficiency that not only reflects credit on himself, but at the same time is a source of great satisfaction to the city. He works entirely on practical ideas, discarding theoretical notions that in the past have proved so expensive to Asbury Park.

Mr. Coffin's statement to council last night that there was no danger of a water shortage this season is worth much to the city, as there will be no need of worry or anxiety.

A Utah Decision on Ownership of Underground Waters.

A decision in the case of the Gunnison Irrigation company vs. the Sterling Coal and Coke company was rendered July 5, by Judge William M. McCarty, at Manti, Utah. He held that there were but three points to be decided: 1. Whether the water in the tunnel driven by the coal company, and which it encountered in driving the tunnel, was percolating water flowing in a well-defined underground channel. 2. In driving the tunnel, were these channels cut? 3. What amount of water was diverted by the driving of the tunnel? On the first and second counts the testimony of the plaintiff and defendant all goes to show conclusively that the tunnel did not tap the underground channels and that the water was not percolating. The third count, and the only one on which there was any question or doubt, is regarding the amount of water to be given the plaintiff. Judge McCarty found that the water coming from the springs found its way to Six Mile creek, and furnished one second-foot of water; that there were other springs that arose in the bed of the creek which, according to the testimony, were 100 inches, others testifying about one-half of the creek; he had found that it would approximate one second-foot. Hence, the plaintiff was given two second-feet of water, is to have costs of the suit, and is to prepare findings and decree and submit it to the defendant, after which the defendant is given thirty days in which to prepare, file and serve a bill of exceptions and statement on motion for new trial.

Results of Advertising in Municipal Engineering.

Mr. Fred J. Warren, president of Warren Bros. Co., has been busily occupied during the last several weeks in visiting cities in the East and West to which he has been called for conference regarding contemplated public work. Mr. Warren states that his company is overwhelmed with calls of this kind as a result of the advertising which has been done in Municipal Engineering Magazine. The company's fourteen pages of advertising in the May number of the magazine awakened a general interest and brought them a large number of letters. "I regard Municipal Engineering," said Mr.

Warren, "as an excellent publication. I have read every number since its first publication. Our advertisement in it has brought inquiries in regard to more than a half million dollars' worth of work, and we are simply overwhelmed with the immediate demands upon us as a result of the publicity our company has had."

Prizes Offered for Engineering Papers.

The Western Society of Civil Engineers announces that through the generosity of one of the members it is enabled to state that three medals will be awarded for the best papers presented by the members in 1901; one in civil engineering, one in electrical engineering and one in mechanical engineering. Further details will be announced at an early date.

Process of Making Artificial Stone.

An English process of making artificial stone, called Owen stone, is described as follows in a lecture by Mr. W. Owen of London:

Quartzose sand is first dried by being heated; it is then thoroughly mixed with hydraulic lime in the proportion of about 12 per cent. of the latter to 88 per cent. of the former. This mixture, still in a dry condition, is packed into very strong molds of any desired shape, the filled molds being subsequently built up in a steel frame or box. The latter is conveyed by tramway to an immense steel cylinder, inside of which it is placed, the cylinder now being closed and the door strongly bolted. Water near the boiling point is then admitted until the cylinder is full, and an indicated pressure of from 60 to 70 pounds maintained. The water is kept in a highly heated condition by steam coils running along the length of the cylinder inside.

On the admission of the boiling water, the hydraulic lime in the molds commences to slake, and the pressure maintained assists in forcing the water into the sand and lime mixture so as to bring about complete slaking throughout the mass. The mixture being confined in strong molds, it follows that the expansion of the material consequent on slaking is not allowed free play, so that immense pressure is set up within the material itself, which tends to render it much more compact that might otherwise be the case.

It is important that as little air as possible should be admitted into the cylinder during the slaking; this is why the water is admitted at boiling point and the temperature kept up by steam coils instead of live steam being injected direct into the water. When the lime is thoroughly slaked, the pressure and temperature are gradually lessened and the material is allowed to cool slowly. When the cylinder is opened, the mixture is found to be converted into solid stone. The latter is in a wet condition, and becomes harder in the course of twenty-four hours. The whole operation, from the packing of the cylinder to the withdrawal of the molds, occupies about fifty hours. The manufactured stone and bricks may be molded into any form, and are of a gray color.

United States Consul Baehr, at Magdeburg, Germany, sketches the German method of producing stone by the same process as follows:

Hydraulic or quick lime, as well as fat or rich lime, may be used; hydraulic lime is preferred, however, if the price warrants it. Of the different kinds of sand the cleanest is the most suitable, but a small alloy of clay is not objectionable. In fact it can be said that all kinds of sand suitable for building purposes or for the preparation of mortar may be used. The proportions are from four to six parts of lime to ninety-four or ninety-six parts of sand, the small variation depending on the quality of the sand. After pulverizing the lime in a ball-grinder, both substances are mechanically measured and then thoroughly mixed by machinery. This mixture is then pressed into stones, which are afterward piled on flat cars and pushed into a cylindrical boiler. The boiler is then hermetically closed and steam turned on at a pressure of eight to nine atmospheres. In about ten hours the process of hardening is finished and the stones are ready for use.

Technical Meetings.

The first annual convention of the league of cities of the third-class of Pennsylvania was held at Erie June 26, 27 and 28. Hon. John Depinet, mayor of Erie, who called a preliminary meeting last year, at which a permanent organization was effected, was elected president.

The program included the following: "Street Cleaning," Joseph C. Cane, Pittsburg; "The Police Department, Its Needs and Efficiency," Hon. James L. Schaadt, mayor of Allentown; "What We Are and What We Ought to Be," Henry A. Clark, Erie; "The Tramp Nuisance," Hon. E. T. Giles, mayor of Altoona; "The Bidder and the Municipality," Thomas R. Crowell, city engineer of Lebanon.

The League of Alabama Cities has been organized through the efforts of Mayors Drennen of Birmingham and John B. Weakley of Florence. Permanent officers have been elected as follows: President, John B. Weakley, mayor of Florence; vice-president, E. B. Joseph, mayor of Montgomery; secretary, W. M. Drennen, mayor of Birmingham; treasurer, T. T. Huey, mayor of Bessemer. The date for the first annual meeting has not yet been announced.

The sixth annual convention of the International Association of Municipal Electricians will be held at Niagara Falls Sept. 2, 3 and 4. Among the papers that will be presented are the following: "The Need of and Value of a Set of Rules for Outside Construction," P. H. Frost, jr., Lynchburg, Va.; "Underground Electrical Construction From a Municipal Standpoint," Edward F. Schurig, Omaha, Neb.; "The Protection of

Fire and Police Telegraph Wires from High Tension Currents of Lightning." W. M. Petty, Rutherford, N. Y.; "Improved Storage Battery for Municipal Purposes," G. W. Aydon, Wilmington, Del.

The twentieth annual meeting of the American Steel Railway Association will be held in New York City Oct. 9, 10 and 11. T. C. Penington, secretary, Chicago, Ill.

The thirty-third annual convention of the American Society of Civil Engineers was held at Niagara Falls June 25, 26, 27 and 28 The program provided a number of topics for discussion, the first of which was the advisability of legal restrictions to govern the practitce of engineering. This discussion was opened by Samuel Whinery, who called attention to the fact that at present any person was at liberty to take up the practice of civil engineering and that many persons were practicing in this capacity who were almost totally lacking in education and natural capacity for conducting engineering work. The well qualified and trained engineer was compelled to submit to the competition of such persons and to be classed with them in public estimation, since the public has no means of judging who were competent engineers and who were not. He proposed that legislation be enacted restricting the practice of engineering to persons whose qualifications had been ascertained by some competent persons. He thought the matter was one for state legislation rather than national. This discussion was participated in by a number of the members. Desmond Fitzgerald moved that a committee of five be appointed to report upon the subject at the next annual convention. Concrete steel construction and water waste prevention were among the subjects discussed.

The convention of the Northwestern Electrical Association was held at Sheboygan, Wis., June 26 and 27. Among the papers presented were the following: "Trades Training by Non-Technically Educated Men," B. V. Swenson, assistant professor of electrical engineering, University of Wisconsin; "The Efficiency Curve of a Shunt Motor and Its Relation to Operating Characteristics and the Cost of Operation," Budd Frankenfield.

The second regular meeting of the Roentgen society of the United States will be held at Buffalo Sept. 10 and 11. Dr. J. Rudis-Jicinsky, secretary, Grand Rapids, Michigan.

The fifth annual convention of the League of American Municipalities will be held in Jamestown, N. Y., Aug. 21 and 24. The program will be as follows: "Municipal Lodging Houses," James K. McGuire; "Special Assessments for City Work," James L. Weeks; "The Contract System for City Work," S. F. Crabbe; "The Value of Municipal Leagues," William S. Crandall; "Municipal Restrictions on Vice," Norman Fox; "The Cost and Durability of Brick Pavements in Ithaca," C. L. Crandall; "The Development of Bituminous Pavements, Embracing the Use of Coal Tar and Asphalt in Street Work," Fred J. Warren; "The Municipalities of the Great Northwest," A. A. Ames; "Low Fares as the Best Method of Remunerating Cities for Franchise Rights," Tom L. Johnson; "Steel and Concrete in Municipal Construction," Merrill Watson; "Taxation," Lawson Purdy; "Practical Application of Uniform Accounting to City Comptroller's Reports," Harvey S. Chase; "Public Ownership of Public Utilities," Lee Meriwether; "Garbage Disposal," George R. Perry; "The Proposed Ohio Municipal Code," Edward Kibler; "Political Liberty," Samuel M. Jones; "Local Self-Government for Cities," James L. Head.

Municipal Reports.

Thirty-second annual report of the board of health of Richmond, Ind. T. Henry Davis, M. D., health officer.

Dr. Davis probably holds the record of continuous service as a health officer, all of the thirty-two annual reports of which this is the latest having been made by him. It is interesting to note that ninety of the 304 deaths were of persons over seventy years of age, thirty-eight being over eighty. Fifty-eight were of those under five years. The city has a crematory for garbage and a small amount of night soil, which operates all the time within two blocks of the court house without nuisance. Its operation cost cost $2,203.46, population 18,226.

Annual Report of City Engineering Department, Scranton, Pa. Joseph P. Phillips, City Engineer.

The city has paid $53,700 for opening new streets, indicating that the improvements are of much value and that the original platting of the districts opened was quite defective. Nearly $100,000 was spent for new sewers, and over $55,000 for asphalt and brick pavements, $46,000 for curb, gutter and sidewalk. The city has about four miles of electric conduits laid by telephone companies.

Annual Report of the Board of Public Works of the City of Woburn, Mass., for 1900. Frank B. French, City Engineer. William W. Wade, Water Registrar.

About $4,000 was expended for macadam street construction and $15,000 for repairs and maintenance and $2,000 for sewers, bringing the total for the latter to twelve miles in length, costing $136,000. The Water Department reports receipts of $45,752, of which $1,730 was from the city for hydrant service. The expenditures were $12,435 for maintenance, $1,015 for new

mains, $2,600 for bonds retired and $5,725 for interest, allowing $576.67 balance to be carried to the sinking fund. The department is evidently paying its way and a reduction of hydrant rental to $800 for next year and probably to zero thereafter is made. There are some indications in the report that additions must be made to the supply and repairs and improvements to the plant which will take what money the works can make for some time in addition to paying maturing bonds. The question of the equity of forcing water consumers to pay expenses, cost of construction and interest while the city at large gets its water supply and fire protection without cost does not seem to have arisen, the reduction in taxes taking the prominent position in the field of view.

Annual Report of the Municipal Lighting Plants of the City of Hamilton, O. John Lorenz, superintendent.

The City of Hamilton is one of the very few cities in this country which operates its own gas plant. It has the competition of a private company, and this competition is now the closer on account of a connection of the private company with a separate coke works, which is presumed to reduce the cost of gas to the company, while the cost of city manufacture is increased by the advance in price of gas coal. However, gas is sold at 80 cents a thousand and the profits of operation for the year were $14,423.38, so that neither consumers nor the department can have any complaint. The profits were used in extensions of mains and services, which are put in free, and in extensions of machinery, etc., to the extent of about $7,600. The sum of $2,690 is due from the city for light furnished, and seems likely to remain due, as the city appropriates less each year than the fixed amount per lamp requires. The remainder of the profits is represented by $2,700 due for sales of gas not yet paid for and an increase in the cash account. The superintendent shows a commendable purpose to keep the municipal accounts independent, though the amount due from the city for light furnished is increasing each year and is now over $12,000, and the amount due from the city electric light plant is still $8,000. Such management as is indicated by the report makes an argument in favor of municipal ownership so far as cost of gas to consumers is concerned, whatever may be the conclusion on theoretical considerations.

Twenty-eighth Annual Report of the Lowell Water Board for 1900. Frank L. Weaver, president; George Bowers, city engineer.

The question of the corrosive action of water upon lead pipes is important here, and the abandonment of two of the wells used as sources of supply was recommended by Dr. Harrington and the State Board of Health. The meter question is also prominent. It is significant that the 51½ per cent. of taps which are metered use about one-fourth of the water consumed. If there are no leaks in mains or errors in figures, this might be taken to show that the waste is one-half and that a full meter system would postpone for some time a threatened necessity for enlarging the supply. The receipts were $210,149.93, and the expenditures were $202,634.80, of which $79,407 was for interest and bonds, $30,100 being for the latter, nearly $13,000 for new construction, and $62,000 for driven wells. Full data of maintenance cost are given and the general form of report of the N. E. W. W. Assn. is used as a summary.

Fifth Annual Report of Wapakoneta Water Works and Electric Light Plant, Wapakoneta, O., C. W. Meely, president.

A careful separation of the accounts of the water and light services is made so that a study of their economy is easy. The water receipts were $3,175.52, and the expenditures ,including the proportionate share of the electric light plant cost were $3,174.32. The light receipts were $15,759.01, including the above from the water plant, and $4,000 from the city for a new dynamo, and the expenditures were $16,094.80, including $3,290 for bonds and interest, making a deficit of $335.79. Not only does the city pay nothing for water and light, but the works pay the small salaries of the trustees and clerk. Charging the fire hydrants at $50, street lamps at $85 and water and light for public buildings at proper figures, the net earnings for water are $2,831, and for light are $3,811, showing the sums which are properly chargeable to the city at large and which are now paid by the consumers of water and light beyond their actual share.

Annual reports of the officers of the city of Columbus, Ga., for the year ending Dec. 1, 1900, including reports of chief of police and chief of fire department for the year ending Dec. 31, and message of Mayor L. H. Chappell:

The superintendent of public works, Robert L. Johnson, reports the extension of the work of grading and curbing streets. Two plans are used, one leaving a park in the center of the street, with a driveway 28 to 30 feet wide on each side, and one placing a 30-foot drive in the center and paving park spaces on each side, which are 50 feet wide on avenues and 20 to 34 feet wide on streets. One mile of this work was done during the year. About 8,500 square yards of brick pavement were laid on 6-inch concrete base at $1.90 a yard. The city has possessed a set of plans for sewers for ten years, but has not yet made a beginning upon the construction of the system.

The mayor reports a saving of $4,270 a year in the lighting bills. Formerly the

city paid $85 per light per year, moonlight schedule. It was proposed to expend $20,000 in putting up lamps and to purchase electric current at a rate which, including all allowances, would make the lights cost the city $45 a year each. The lighting company, however, agreed to furnish all-night lighting, except three nights a month at full moon, for $50 a light, and their offer was accepted.

Fifth annual report of the commissioner of highways, Ontario. A. W. Campbell, commisisoner.

The duties of the commissioner of highways of the province of Ontario have heretofore been advisory and a large part of his duty has been to promote the cause of good roads by lecture and correspondence. A prominent portion of the report is a lecture given in one of the typical townships. Articles on road machinery and concrete culverts and specifications for cement-concrete walks are given. The texts of the law passed at the recent session of the legislature are given, appropriating $1,000,000 as a means of co-operating with counties and townships in improving public highways, and providing for the purchase of public roads.

Annual report of the street department of the city of Boston, Mass., 1900. B. T. Wheeler, superintendent of streets.

The work of the department is carried out under the organization of the department by a number of divisions. The total of the expenditures supervised by the various divisions was $5,068,660, of which $2,681,843 was for maintainance of the various works and the remainder for new construction. The bridge division expended about $145,000, nearly all for maintenance and repairs. The ferries of the city are operated under the ferry division. The expenditures were $237,000 for maintenance and $105,000 for new boat and landing. The receipts were $166,830, from over 12,000,000 passengers and 931,000 teams. The paving division expended $782,700 for maintenance and $1,155,631 for new construction. The sanitary division takes charge of garbage collection and disposal, which cost $609,664. The sewer division expended over $362,000 on maintenance, $921,000 on the sewerage works and $190,000 on the Stony Brook improvement. Street cleaning cost $339,747; street watering, $175,000. More detailed notice of the work of some departments will be made later with illustrations of some of the more important work.

Fourteenth annual statement of the street and sewer department, Wilmington, Del., year ending Jan. 31, 1901. Harvey J. Wiley, secretary.

The report opens with a table of data regarding the city and its improvements, giving details for each year since 1887, the date of establishment of the present system. The paving of the city was largely done in the years 1891 to 1898, and the main sewer construction in 1889 to 1895. There are now fifty-four miles of paved streets. These streets are cleaned at an annual expense of about $15,000, which is about one and one-half cents a square yard. The barrow patrol system is used to some extent. Wooden street signs have proved their superiority in this city as elsewhere. A new plumbing inspection ordinance went into effect May 1, 1901, providing for a practical plumber as inspector at $1,500 a year, licensing of plumbers, deposit for cutting into paved streets, filing of plumbing plans, inspection of work and regulations governing the character of work permitted. Arc lamps cost $100 each, incandescent lamps, $18,71 and gas lamps, $16,62, burning all night and every night. Reports of receipts and expenditures are given in extreme detail.

Report of the department of track elevation of Chicago, 1900. John O'Neill, expert and commissioner; Edgar A. Rossiter, engineer.

The report gives a statement of the amount of work done by each railroad under each ordinance for track elevation which has been passed by the city council. It is very profusely illustrated with plans, maps and reproductions of photographs, thus giving a better idea of the work and its effect than could be obtained in any other way. More detailed notice of some of the features of the report will be made in future numbers.

Annual Reports of the city officers of the city of Burlington, Ia., for the fiscal year ending March 31, 1901. H. G. Marquardt, mayor; Emmet Steece, city engineer.

The bonded indebtedness of this city is taken care of by sinking funds in a manner more satisfactory than in most cities of this size. The city finds it necessary, however, to have a large floating debt, borrowed in anticipation of receipt of taxes, which is not so well taken care of. A comparatively small part of the streets is improved and the sewer system is very inadequate. Arc lights cost $100 a year. Either the price must be reduced or the number of lights, as the lighting fund is running behind. A material reduction in the price would seem possible in comparison with the prices paid by other cities of the population of Burlington. The city engineer reports the results of some interesting experiments on the adhesion of Portland cement, apparently made by cementing with neat cement mortar briquettes which have already undergone a breaking tensile strain. The briquettes are pulled apart again by the application of 11.5 to 26.5 pounds at the end of twenty-four hours, 202 to 565 pounds at the end of thirty days and 275 to 423 pounds at the end of sixty days. Another series of briquettes of Portland cement was tested

for the effect of freezing temperatures, showing material reductions in strength. The information regarding these experiments is not detailed enough to be satisfactory.

Mayor's message and annual reports of city officers of Cedar Rapids, Ia., for year ending Dec. 31, 1900. John M. Redmond, mayor; G. H. Merridith, city engineer.

The city has reduced its bonded and floating debt over $15,000 during the year, and has also paid unusual expenses of about $33,000 during the year, about half of this being on account of new city hall. The city engineer gives a statement of the experiences with wooden block and brick paving, showing the failure of the former as laid, and the unsatisfactory character of insufficient foundations under the latter. Unauthorized and careless replacing of trenches is also cause for rapid deterioration of pavements. Street railways also make trouble on account of light construction. The city has about 7,500 square yards of asphalt paving, laid on 6-inch concrete foundation, at $1.56 a yard, not including grading. Other contracts for asphalt have been let.

About two miles of 6 and 8-inch sanitary sewer was laid during the year, at a net cost, not including incidentals and engineering, of about 62 cents a lineal foot. Most of the flush tanks on the system are of 125 gallons capacity. The engineer calls attention to the uselessness of such small flushing capacity and the saving in water by using tanks averaging 800 gallons capacity and discharging at less frequent intervals, which will give good service, while the present system gives practically no service. The sewer inspector reports a vegetable growth in sewer district No. 2 which requires cleaning out with ball and rope every two or three months—the most economical method, he thinks. Arc lights cost about $72 each, a reduction of about $16 from the price two years ago. The progress of the city's contest with the water company has been reported in our columns from time to time.

Mayor's message to Board of Aldermen of Morristown, N. J. Norman Fox, mayor.

Morristown has a mayor who has acquainted himself with the details of the government of other cities as well as his own, and in this message he shows where the administration of the government of the city can be improved and where it is now better or more economical with satisfactory service than in similar localities. He finds more causes for congratulation in his comparisons than for recommendations of improvements. This is especially true of the fire and police departments, and for the latter department he recommends a material increase in rate of pay.

Road Improvements in New Jersey.

With regard to the article on page 12 of the July number of Municipal Engineering on the subject of "Road Improvements in New Jersey" we have received a letter from H. I. Budd, the state commissioner of public roads, from which the following extract is made:

I am very much pleased with the prints and with the article. There is one error in the amount the state pays. The state pays one-third of the cost instead of 25 per cent. of the cost.

There is one remark you make that is very appropriate. The best of roads cannot be kept in good condition without attention and the addition of proper materials. Unimproved roads do not cost much because there is very little expense per mile placed upon them, but if kept in proper condition they would be more expensive than the improved roads. We have gravel roads in our state where they have been properly cared for that are good after being subject to severe wear for forty years. Of course they are not like stone roads—good at all seasons of the year. There may be a month or two in the year when they are not hard and smooth, when frost is coming out of the ground or when there have been long continued wet spells. The greatest advantage of an improved road is its ability to bear heavy traffic and the privilege it gives the farmer to get to market irrespective of the conditions of the weather.

Petitions are so numerous for new roads in our state that a million dollars each year would be required to keep up with the demand.

New Bids to Be Received for Indianapolis Street Lighting.

The receipt of bids for street lighting in Indianapolis, as advertised in the July number of Municipal Engineering, was stopped by injunction proceedings. New specifications, intended to remove the prohibited requirements, have been prepared and are now under consideration by the Board of Public Works, Albert Sahm, president. It is probable that specifications will be adopted in a very few days, and that another date for receiving bids will be set. At the time of going to press the date has not been set, but it will probably be earlier than Sept. 1. Those interested should apply directly to the board for the new specifications and date of letting.

New Publications.

Proceedings of the Purdue Society of Civil Engineering 1900-1. A. S. McBroom, Editor, Lafayette, Ind.

Several excellent papers by professors and students in Purdue University are contained in this volume on such subjects as Modern Creosoting Plants, Concrete, Leveling, Errors of Traverse Surveys, Equipment and Management of an Engineers Field Party, Timber Beam Diagram and a Masonry Estimate Table.

The Technograph. C. F. Drury, Editor, University of Illinois, Champaign, Ill.

The usual good standard of this annual of the technical societies of the University of Illinois is maintained. The papers by grad-

uates, professors, students and others cover the field of mechanical, electrical and civil engineering. Abstracts and extracts from some of these papers will appear in our columns from time to time.

Transactions of the Association of Civil Engineers of Cornell University, 1901. E. B. Whitman, Editor, Ithaca, N. Y.

A number of excellent papers, most of them by graduates of the university, fill the 100 pages of this volume and are accompanied by good illustrations. A list of names and occupations of members, including all graduates of the institution, is added. Five papers are on bridge and viaduct construction and one each on the Buffalo Breakwater, the Chicago Harbor, Interurban Electric Railways, Tunnel Lining, Dams and Foundations.

Bulletin of the Department of Labor, dated May, 1901, Carroll D. Wright, Commissioner, Washington, D. C.

This number contains articles on labor conditions in Porto Rico and on social economics at the Paris exposition, together with reports of decisions of courts affecting labor and reviews of American and foreign statistical publications.

One Phase of Citizenship, prepared by Hester M. McClung, Secretary of the Woman's Sanitary Association of Indianapolis. 40 pp., paper.

This little book contains a record of an association which has done much to aid in putting the city of Indianapolis into the excellent sanitary condition which it now enjoys, and will be of great value to those desiring to do similar work in other cities who are at a loss to know what to do and how to do it.

Slide Rule for Determining Street Crowns. E. L. Andrews, inventor, Oil City, Pa.

This rule is prepared on the model of Colby's Sewer Computer, and will give the crown of a street of any width and gradient, according to Rosewater's formula, and also the ordinates at various fractions of the width. It is quite convenient and city engineers can find a use for it.

A Bibliography of Municipal Problems and City Conditions. By Robt. C. Brooks. Second edition revised and enlarged. Complete to Jan. 1, 1901. New York. Reform Club, Committee on City Affairs, 52 William-st., 346 pp.

This is the quarterly number of Municipal Affairs for March, 1901. A superficial examination of its pages can do no more than allow an estimate of the thoroughness with which the field is covered by inference from the small part of it with which the reviewer is familiar. Judged in this way, the performance of the task set has been very satisfactorily completed. The statements that there are about 12,000 entries in the subject index, and 8,000 titles of books of 4,500 authors, will give some idea of the scope of the work. To any one studying any municipal problem the book is invaluable.

The Iowa Engineer, Edited by the Heads of Departments of Iowa State College, Ames, Iowa.

The first number of this quarterly publication is issued with the date, June, 1901. It contains articles upon engineering subjects from the mechanical, civil, electrical and mining engineering departments of the college. A report on some absorption, freezing and transverse breaking tests of dry pressed building brick is of interest, also one on the Boone viaduct.

Annual report of the Board of Regents of the Smithsonian Institution, 1899. S. P. Langley, secretary, Washington, D. C.

In addition to the report of operations and expenditures this volume contains a number of papers on subjects in physics, geology, paleontology, botany, zoology, anthropology and general science, of which perhaps the most interesting to those interested in engineering are Thurston's on the century's progress in the steam engine, White's on progress in steam navigation, and an account of Van Zeppelin's dirigible airship.

Personal Notes.

H. Shaner has been elected city engineer at Lynchburg, Va.

D. C. Borton has resigned as city engineer at Massillon, O.

George A. Perrill has been appointed city engineer at Salina, Kas.

T. D. Allen has been appointed city engineer at Pasadena, Cal.

William H. Floyd has been appointed city engineer at St. Joseph, Mo.

William H. Sieverling has been appointed city engineer at Springfield, O.

T. A. White, C. E., has opened offices at 122 W. Oklahoma-ave., Guthrie, O. T.

H. B. Brewster has been appointed assistant city engineer at Syracuse, N. Y.

The Hon. J. W. Shaw, mayor of Roseville, O., has tendered his resignation to take effect at once.

Robert L. Johnson has been re-elected superintendent of public works and city engineer at Columbus, Ga.

Jacob P. Dunn has been appointed city comptroller, to succeed E. M. Johnson, resigned, at Indianapolis, Ind.

Ashley B. Tower, M. Am. Soc. C. E., consulting engineer, died at his home in Montclair, N. J., July 9, aged fifty-five years.

Thomas Moore Rogers, president of the Worcester electric light company, Worcester, Mass., died July 9, aged eighty-three years.

George H. Nye, founder of the Nye Steam Pump and Machinery company, died July 7, at Austin Ills., aged sixty-five years.

E. Anderson, formerly chief engineer of the Tiler & Stowell company of Milwaukee, Wis., has accepted a similar position with the Brown-Corliss Engine company of Milwaukee, a new concern which is building an extensive manufacturing plant near Milwaukee.

Irwin Watson has resigned his position as city engineer at Traverse City, Mich., to accept a position with George S. Pierson, consulting engineer, Kalamazoo, Mich.

Y. Nakajima, engineer of the Tokio water works will leave Japan for the United States. He will spend about a year in this country and Europe studying municipal works.

Robert Lewis Ames, C. E., is now associated with Jones & Addington, attorneys, Chicago, in charge of their technical work in engineering lines, especially in questions relating to patents.

Henry R. Bradbury, well known to engineers through his connection with asphalt industry and more recently with the Virginia Portland Cement company, died at his home in New York July 3 of heat prostration.

H. C. Ayres has tendered his resignation as superintendent of the Greenville Electric Light and Power company, Greenville, O., to take effect Aug. 15. Mr. Ayres has accepted a position with the Michigan Electrical construction company, with headquarters at Detroit.

Samuel Whinery, Dir. Am. Soc. C. E., and consulting engineer, 95 Liberty-st., New York, has been appointed chairman of the board of engineers appointed to consider plans for the betterment of conditions at the Manhattan terminal of the Brooklyn bridge, to succeed the late Thomas C. Clarke.

MACHINERY AND TRADE.

Brinly-Hardy Plows on the Good Roads Train.

The Good Roads Train, which has been doing such excellent educational work in many places along the line of the Illinois Central railroad, has as a part of its equipment four of the road plows of the Brinly-Hardy company of Louisville, Ky. They are the only plows used in the demonstrations of methods of treating bad roads, and have proved themselves to possess great strength and durability.

Wisconsin Graphite Mines.

Portage county, Wisconsin, is reported to produce a grade of Graphite Carbon superior to the Hungarian Graphite in the German market. Several analyses of the Wisconsin production have shown the carbon present to be as high as 72 per cent.

The mines were discovered in 1853 by E. E. Taggart of Stevens Point, Wis., who in prospecting for iron discovered a deposit of carbon, which is high in purity and underlies a large area. A company was formed to develop the mines, and a complete plant established, which has run to its full capacity, and the product has been disposed of as rapidly as it could be prepared for the market.

A short time ago Pittsburg capitalists became interested, and organized the Wisconsin Graphite company of Pittsburg, for the manufacture of this product into graphite paints, motor greases, pipe joint pastes, lubricants, and for use in the making of steel and crucibles, and their sale in the states of Ohio, Pennsylvania, West Virginia, New Jersey and New York. It is considered that over 70 per cent. of all the users of these products are located in this territory.

Granular graphite, such as is mined by this company, is considered the best form of graphite. As a paint for iron the Wisconsin product is generally recommended because of its tenacity, its resistance to atmospheric action, its insolubility in acids, its fireproof qualities, its inflexibility (it being almost impossible to scale or crack it by bending the iron), and its wearing qualities.

The iron oxides found on the properties of the Wisconsin mines have been severely tested and found to produce a very superior oxide for mineral paint, such as is used for freight cars and other exposed woodwork.

Trade Publications.

The Trinidad Asphalt Manufacturing company of St. Louis, Mo., issues a 100-page catalogue of its manufactures of various kinds of roofing materials, asphalt paints and varnishes, mastics, paving and roofing cements and specifications for laying asphalt pavements with their paving cement and liquid asphalt under which they have been laid in a large number of cities. Many facsimile letters commendatory of their work and materials are also given.

The Lehigh Portland Cement company of Allentown, Pa., has issued an attactive little book giving views of their quarries and mills and of work constructed with their cement, accompanied by a description of their plants and of methods of making their concrete buildings. Many reports of tests and reports of the use of the cement are included in the book.

A useful little book entitled "How to Use Portland Cement," by Wm. G. Hartranft, is issued by the Wm. G. Hartranft Cement company of Philadelphia, which gives valuable pointers on cement, its testing, mixing and use, and also advertising the Old Dominion Portland Cement, made by the Virginia Portland Cement company,

for which the Hartranft company is the sole selling agent. The pamphlet is fully illustrated.

The July number of Power and Transmission, published by the Dodge Manufacturing company of Mishawaka, Ind., illustrates the pliability of the American system of rope transmission, and continues its articles on industrial betterments with a description of the arrangements of the Sherwin-Williams Paint company for the comfort and convenience of their employes. There are other interesting articles on various details of power transmission. A special Fourth of July supplement gives a brief account of the history and the location of the company and its products.

The catalogue and price-list for 1901 of the T. F. Randolph company, Cincinnati, O., contains an illustrated list of their surveyors and engineers' instruments and supplies.

The St. Lawrence Power company of Massena, N. Y., issues a handsome prospectus illustrating their large new power plant and showing the attractions for locating manufacturing plants where the power can be made use of. Ninety thousand horse-power of turbine wheels is now being installed, and the amount of power can be extended indefinitely.

Instructive booklets illustrative of the use of the Ransome system of concrete and cold twisted steel construction are issued by the Ransome Construction company of Philadelphia, the Aberthaw Construction company of Boston and the Paige Concrete Fire-Proofing company of Cincinnati, who operate the system.

Ransome & Smith company of Brooklyn also issue a descriptive and illustrated catalogue of Ransome's patent concrete mixers.

A paper entitled "Railroad Concrete Masonry," by W. A. Rogers, formerly construction engineer on the C., M. & St. P. R. R., is issued with the compliments of the Atlas Portland Cement company of New York. It is a very valuable discussion of the materials for and the manufacture of Portland cement concrete.

The American Well Works of Aurora, Ill., have issued their encyclopedia for 1901. It is well named, for there is nothing which can be used in drilling, setting, operating, cleaning or pulling wells which is not described and illustrated in the 180 pages of this catalogue of the company's manufactures. Full details of sizes and prices and full instructions on how to order are included.

A twenty-two-page pamphlet entitled "Litholite" presents the claims of the manufactured stone of this name by C. W. Stevens of Chicago, and gives photographs showing work in which it has been used and samples of forms into which it can be fashioned.

The New York and Franklin Air Compressor companies of 95 Liberty-st., New York, with works at Franklin, Pa., have issued a very handsome edition of the catalogue B, descriptive of the air compressors manufactured at their new works.

J. Watts Kearny & Son, 421-7 Gravier-st., New Orleans, La., issue a convenient little catalogue of the building materials and stores which they can supply.

The Ft. Wayne Electric Works issues dated bulletins at irregular intervals bearing serial numbers and containing information concerning specialties of their manufacture, which are perforated for easy filing on a catalogue filing system.

The German Secret Process Steel Ball company is "Another Industry Coming" to the United States, with office at 29 Broadway, N. Y., which issues a little pamphlet with this title describing its ball bearings.

Tomkins Bros., 74 Passiac-st., Newark, N. J., issue a neat little pamphlet devoted to Dexter Portland cement, of which they are sales agents.

The Eastern Machinery company issues a very convenient catalogue and price list (No. 5) of Frisbie Friction Clutches, giving also descriptions of their action, a statement of their advantages, and directions for fitting and adjusting them.

Trade Notes.

ASPHALT.

The reorganized North Alabama Oil & Asphalt company has elected as president J. L. Lockwood of Birmingham, Ala.; vice-president, J. F. Halsey, New Decatur, Ala.; secretary and treasurer, W. F. Robinson, Blount Springs, Ala.

The Ohio & Kentucky Asphalt company of Cincinnati, O., has been incorporated by Frank H. Kirshner, Frank F. Dinsmore, M. F. Bramley of Cleveland, P. R. Quinlan, C. M. Warner, Cincinnati.

The contract for supplying the city of Syracuse, N. Y., with an asphalt repair plant was awarded to Robert Hooke of Chattanooga, Tenn., for $400.

Rich deposits of asphalt have been found in the Cherokee nation near the Comanche reservation, in which Dennis F. Flynn, Charles E. Billingsley and others of Guthrie, O. T., are interested. C. W. Brown of Comanche, I. T., is secretary of the company.

Reports from Nevada, Mo., state that an analysis of the black, oil-saturated rock in Vernon county shows it to be a high-grade asphaltum. The asphaltum discovered on the farm of Henry Hogan is sixty feet thick, one-quarter mile long, and is worth $15 a ton in the crude state.

BRICK.

The down-draft brick kiln of D. J. Curtis & Son, Springfield, Mass., is being filled, ready to burn vitrified brick. The kiln will hold 125,000 brick.

Local press reports state that paving bricks will be manufactured in Oklahoma City, Ok. T., within a year.

The Brookfield (Mo.) Pressed Brick and

Tile Mfg. company has been organized with H. De Graw as president and C. H. Jones as secretary, and a plant for manufacturing paving and building brick will be erected.

The Boone Brick, Tile and Paving company, Boone, Ia., has been incorporated by O. W. Nystrom, J. F. Yegge, Thomas Bowman, P. Hollenbeck and C. A. Kellogg. A large plant will be erected for the manufacture of paving and common brick and tile.

CEMENT.

The American Portland Cement company of Detroit has secured property at Runyan Lake, Mich., and will commence the erection of a plant.

The Carolina Portland Cement company, Charleston, S. C., will install a plant for the manufacture of cement.

The cement plant of James Morgan & Co., at Longue Point, Canada, was destroyed by fire July 7, entailing a loss of $50,000.

The Iola Portland Cement company, Iola, Kas., began July 1 running its plant to its full capacity, and is now manufacturing from 2,500 to 3,000 barrels of cement every twenty-four hours.

A company is being organized to manufacture cement at Kutztown, Pa.

The Ohio Cement Works at Lisbon, O., were destroyed by fire, causing a loss of $16,000.

The Krause Cement Works, Martin's Creek, Pa., which were destroyed by fire recently, have been rebuilt and are in operation.

The Great Western Cement company was incorporated June 27 by Kenneth K. McLaren, Augustus S. Meeker and Clifford W. Perkins of Jersey City, N. J.

The Evansvile Cement company has been incorporated by Ralph McKee, New Brighton, L. I.; George R. Allison, John W. Avery, New York City.

The Pennsylvania Portland Cement company has been incorporated to manufacture cement by Foster E. Harvey and William L. Brockway of New York City; Michael J. McTiernan, Jersey City.

A cement company is being formed at Birmingham, Ala., according to press reports.

The Passmore-Meeker company was incorporated July 3. The principal office will be at 192 Market-st., Newark, N. J. Harry L. Jenkinson will act as agent. The company will manufacture and deal in monuments, tile and cement.

The United States Portland Cement company, Elizabeth, N. J., has been incorporated to manufacture cement, lime and plaster building blocks and concrete of all kinds. Ernest R. and Marion S. Ackerman and Leslie M. Daniel of Plainfield, N. J., are the incorporators.

The International Cement company has been organized to manufacture cement from slag. The company is chartered under New Jersey laws, with the following officers: President, James B. Graham, Pittsburg; secretary, Samuel G. Stafford; treasurer, William Lloyd, jr., 606 Real Estate Trust building, Philadelphia.

D. P. Thomas and associate are preparing to open the cement and plaster mill he acquired at Dillon, Kas. The cement is made of cement rock, which is found in no other place in the state.

William Wirt Clarke & Son, Baltimore, Md., will supply Akron Star cement for repairing the Union railroad tunnel that collapsed in June. The company has also received orders from the Brooklyn navy yard for 1,000 barrels of Bonneville Star Portland cement, intended for export to the Philippine islands.

The Alta cement plant, near Rushsylvania, O., has begun operations.

The erection of two plants for the manufacture of Portland cement will begin soon at Suisun, Cal., one to be owned by the Pacific Portland Cement company and the other by the Eureka Portland Cement company. The directors of the Pacific company are Geo. Stone, Nathan L. Bell, Joseph F. Kilby, Samuel McMurtrie and Morris Kind. The directors of the Eureka company are L. Rosenfeld, H. Rosenfeld, W. H. Talbot, H. W. Goodall and A. T. Fletcher.

The National Portland Cement company of Wampum, Pa., has been reorganized and incorporated under the name of the Crescent Portland Cement company.

The Lehigh Portland Cement company of Allentown, Pa., has been awarded the contract for supplying Portland cement to the District of Columbia.

The Capital Portland Cement company has been incorporated by John W. Manning and T. B. Marshall of Trenton and A. H. Bigelow of Stewartsville, N. J. The company has purchased land at Stewartsville and will erect a plant.

LIGHT, HEAT AND POWER.

The Westmoreland Light, Heat & Power company has been organized at Greensburg, Pa., and has absorbed the Westmoreland Electric Light company, Irwin Electric company and Jeannette & Marion Electric Light company.

The Quincy Steam, Heat & Light company of Quincy, Ill., has been incorporated to operate a light, heat and power plant by J. C. Hubinger.

The Georgetown Water, Gas & Power company, Georgetown, Ky., has been incorporated by J. P. Jackson of Georgetown and Holseman of Cincinnati.

The National Electric Light, Heat & Power company, Newark, N. J., has been incorporated. Thomas Edison is interested.

The Ackerman Compress Warehouse & Electric Light company, Jackson, Miss. has been incorporated.

MISCELLANEOUS.

William B. Scaife & Sons, Pittsburg, Pa., have been awarded contract for the manufacture and erection of a steel frame boiler house for the L. Glesenkamp & Sons' carriage works of the same city.

The new plant of the Carnegie Tube company, Carnegie, Pa., will be one of the most complete pipe mills in the country. All the buildings will be of steel frame construction. William B. Scaife & Sons, Pittsburg, Pa., designed the buildings and also have the contract for their manufacture and erection.

The Mercer Construction company, Wilmington, Del., has been organized to build bridges and operate railroads.

The Mohawk Valley Stone company has begun to operate its new stone crushing plant at Canajoharie, N. Y.

A stone quarry is being opened at Dimock, Pa., by Orange Whitney, from which he expects to take flagging.

The Kemble stone quarries at Lumberville, Pa., have been reopened by the Trenton Stone & Construction company of Trenton, N. J. The output of the quarries is trap rock, brownstone and bluestone.

The Texas Quarry & Manufacturing company of San Antonio has been incorporated by John Fitch, William Knight, George Van Buren, Charles M. N. Nero and Hugh McKnight.

The Peninsular Bridge company, Sea Breeze, Fla., has been incorporated to build bridges. The officers of the company are as follows: President, C. C. Post; vice-president, C. A. Ballough, treasurer, W. E. Ballough; secretary, Thomas A. Davis.

An order was obtained from the circuit court recently by R. W. Furnas and the Indianapolis Street Cleaning company, Indianapolis, Ind., enjoining the General Contract company from infringing on the Furnas rights by leasing or selling Furnas pneumatic street sweepers so that they may be used in Milwaukee or any other cities besides those in which it has grants. Under contracts the General Contract company has the right to use the machines in Washington, D. C., and Buffalo, N. Y. It is claimed that the General Contract company has placed some of the machines at the disposal of a contractor named Crilley, who was recently awarded a street cleaning contract in Milwaukee.

SEWER PIPE.

William Wirt Clarke & Son of Baltimore, Md., report that the demand for terra cotta sewer and culvert pipe has been good and the factories do not seem able to supply the demand. This was partly owing to the fact that some of the works have been closed for repairs.

A new sewer pipe plant is being built at St. Mary's, Pa., by H. H. Ault of Toronto, O. D. B. Anderson of Toronto is general manager of the new plant.

A deposit of clay has been opened up in Taylor's Canyon by the Ogden Clay and Sewer Pipe company of Ogden, Utah. This company has succeeded to the business of the Enterprise Clay works at Ogden, and the plant will be operated under the management of W. E. Wester.

The Bibb Brick company, Macon, Ga., has been incorporated to manufacture brick, tile and sewer pipe. J. N. Neel, L. P. Hillyer, A. H. Small and J. H. Alexander are interested.

The brick and sewer pipe works at New Cumberland, O., will be put in operation, according to press reports.

SELECTIONS FROM THE PRESS.

Concrete Construction, Mixtures and Manner of Placing in Forms.

My object in this talk on concrete construction is to give a few practical suggestions based on actual experience. I have no new theories to advance, but am a believer in the use of a wet mixture, and of such proportions as to give a maximum of strength under compression, always using Portland cement, and where economy is necessary I would introduce large stone in the heart of the mass, or cellular construction, but would not cheapen the concrete.

My remarks will be from the standpoint of the purchaser and contractor, as well as the engineer. As engineers I think we are apt, in our desire to secure good work and uniform results, to introduce unnecessary refinements, resulting in increased cost, retarding the progress of the work, and often defeating the end in view.

In connection with this I will first take the subject of specifications, and right here I would say that as concrete is almost always used in compression, I would recognize no test but that of the actual mixture to be used in the work, and that under compression. This demonstrates the excellence of all the ingredients, and if they are properly proportioned. It is often the case with excellent ingredients, that low results are obtained by reason of wrong proportions. To illustrate: Last summer I had occasion to test the value of copper slag and lake gravel in concrete. The gravel alone mixed 5 parts gravel to one of cement, was good for about sixty tons ultimate compression in seven days. The standard of excellence desired was that obtained by limestone and gravel, mixed 1 cubic foot of cement 2¾ cubic feet limestone, passing a 2-inch ring, everything from ½ inch and under excluded, and 2¼ cubic feet of lake gravel, which gave an average ultimate compression in seven days of 135 tons per square foot.

My first tests on the slag mixture gave only about 80 tons per square foot in seven days and appeared to demonstrate a low value for the slag. Examination of the fracture though showed an excess of gravel, and a fracture through the spaces where the most gravel existed. A slight diminution in the quantity of the gravel gave results of over 140 tons in seven days. While mentioning the copper slag, I find from chemical analysis it appears free from deleterious chemicals, except lime. Its use in work of four years standing seems to prove the absence of free lime. It can be obtained cheaper per cubic yard than stone, but by reason of its great weight (about 3,300 lbs. per cubic yard for run of crusher, against 2,800 lbs. for limestone) the cost of

transportation and handling is increased. Due to its weight and abrasive qualities, the duty is harder on the mechanical mixer and tools, and it is more apt to separate itself from the other ingredients when thrown from a height, or used with a large amount of water, than limestone, and while apparently economical, it is largely offset by the objections mentioned.

Continuing on the subject of specifications our object in view is greatest strength, complete filling of voids, and a smooth exterior, all of which can be obtained by simple means. An excess of fine material, while producing a good finish, weakens the concrete; imperfect filling of voids produces rough work, and is also an element of weakness. Therefore, to definitely define the exact proportions to be used in any piece of work, necessitates an intimate knowledge of the exact materials that will be used by the contractor to whom the work is awarded, as stone from different quarries does not produce the same fracture or amount of fine material. It is seldom wise to state the exact proportions, except that of the cement to the rest of the aggregates, the remaining ingredients to be so proportioned as to fill all voids, without an excess of fine material, leaving the exact amounts to be determined by experiment with the actual materials to be used when placed on the work.

Specifications should state the minimum size of broken stone allowed, as well as the maximum, as broken stone is graded in five commercial sizes, and to determine the voids it is necessary to know the sizes included in the coarse aggregate. As a measure of economy it is well to specify run of crusher, dust removed. This is usually sold at 5 per cent. less than the graded sizes, and contains about 20 per cent. more material, leaving less fine material to supply to fill voids, resulting in a saving of 25 per cent., which will be offset somewhat by greater cost per cubic yard for transportation.

Thorough ramming should always be specified. The general impression amongst men employed in placing concrete is that little ramming is required if the mixture is wet. This is a mistake. Large voids will show in the face of the work if not thoroughly tamped, and the fact that wet mixtures are seldom tamped enough is one of the reasons why it sometimes does not show up so well in testing as compared with dry mixing, which must necessarily be thoroughly tamped.

Thorough mixing also should be insisted on, and on all work where an amount to exceed forty cubic yards per day is placed, mechanical means should be used. In this way greater strength and uniformity can be obtained at less expense than by the addition of cement.

A concrete composed separately of several of the commercial sizes of broken stone, gravel, sand, etc., is always expensive. Taking as the coarser size stone passing a two and one-half-inch ring and filling voids by the addition of the smaller sizes, sand, etc., would take forty-five cubic feet to make one cubic yard in place, or a yield of 60 per cent., besides adding to the expense of the handling, and being very difficult to properly proportion by the ordinary laborer. Equally good results would be obtained by run of crusher, sand and cement, giving only three ingredients to watch, and resulting in a very material saving of expense. As eternal viligance is the price of success in concrete work, simplifying of methods is desirable, besides I think we err when we introduce refinements which at an increased cost give no corresponding results.

To produce smooth work the addition of granolithic face, or plastered surface is unnecessary. Smooth forms, with concrete well proportioned, will give just as smooth work at much less cost, leaving the whole mass uniform, without a line of separation, or different compressive strength. As illustrations of this the concrete foundation and floor of the Eastern elevator, and the foundations of the new Dakota elevator are good. A large portion was placed in midwinter, and proves that good work can be done at all times and seasons, although the expense is about 20 per cent. greater.

Another way to produce finish is to joint the concrete to represent masonry, using rough lumber for forms, then bush hammering the face, which can be done by an ordinary laborer at 1½ cents per square foot, the amount saved by using rough lumber going a long way toward paying for the bush hammering. This removes all impressions from inequality of molds, efflorescence, etc. The front of the Eastern elevator facing the dock is so treated.

The preparation of forms calls for considerable ingenuity, and every contract requires special study, to the end that smooth surfaces be left, with unbroken corners, that the swelling of the wood does not rupture the concrete or leave distorted surfaces, and that the forms be so designed as to be used several times, and readily set up and taken down, and later on converted to other uses, as the charge for forms against the concrete can seldom be kept below 50 cents per cubic yard. For heavy work there is always an opportunity for careful plans, and all depends on the ingenuity of the designer, as few rules can be laid down for his guidance. The use of matched or tongued and grooved stuff is not desirable, as concrete fills in the openings and there is no opportunity to expand from moisture. Unmatched boards dry apart and let the water in the concrete leak

out, carrying with it some of the cement. Later on they swell and buckle, and if used as interior forms burst the concrete. The best way devised so far is to bevel one edge of the boards, using narrow stuff, not to exceed six inches. The sharp edge of the bevel lying against the square edge of the adjoining board allows the edge to crush when swelling, closing up the joint, and preventing buckling.

A coat of soft soap before filling the forms prevents the concrete from adhering to the forms, which should always be scraped and brushed with a steel wire brush when taken down.

Square corners should be avoided as they readily chip off, and where used as interior forms for recesses or cellular construction a fillet should always be placed in the corners.

Concrete can often be saved by introducing cells in the mass, either by cheap hemlock boxes, which can be left in the work, or by collapsible boxes which can be with drawn and used over again. Where weight is desirable one man stone can be rammed in the heart of the mass, reducing the cost very materially.

Where for economy in handling or other reasons it is desirable to dump the concrete a considerable hight, some precautions should be taken to avoid having the coarse aggregates separate from the rest of the mass. This can be accomplished in several ways; either by chains loosely stretched at intervals across a chute or by shelves extending part way across the chute at an incline, so as to deposit on a corresponding shelf on the opposite side, so alternating the length of the chute. Either of these methods is a direct benefit, as they more thoroughly mix the concrete.

Our building laws, as a rule, show little knowledge of the value of concrete, ordinarily limiting its use to sixteen tons or less per square foot, a larger factor of safety than is required for any other material. This probably is due to the large amount of poor concrete turned out, and also to exclude from the building trades a material that can be placed by unskilled labor.

Regarding the introduction of steel or iron in its various forms in concrete to give tensile strength, there is no question as to its utility if properly used. I claim no special knowledge of any of the systems except the Ransome, which appears to me the best for the following reasons, it is a perfect system from which the entire structure from foundations to roof can be made, without the introduction of I beams, or metal frame work of any description, except moulding in the cold twisted square steel bars.

The cold twisting the square bars receive has many advantages possessed by no other system. The twisting prevents the rod from drawing in the concrete, making the grip on it continuous and uniform, rendering the strains all equal. It further decreases the ductility of the metal acting more in harmony with the concrete, a vital point, when the nature of the concrete is considered. Incidentally we also gain a marked increase in tensile strength, which in practice we generally throw in as an extra factor of safety. Its application is in its infancy, and in a short time I predict it will be used in many ways not now thought of. Its application so far has been markedly successful. The floor of the Eastern Elevator is, I believe, the boldest application to date, of this or any other system. The actual load on the floor is 4,470 pounds. The dead weight of the floor is 300 pounds per square foot, taking the load as uniformly distributed. When we consider that the grain load is concentrated on the rim of the tank, and generally taken as two-thirds of the whole load, and that the supporting columns, owing to the peculiar lay out of the property, have no relation to the position of the tanks, also that in practice some bins are full and other empty, giving eccentric loading, the problem was a difficult one. Its efficiency is still to be demonstrated. Of its success I have no question. The basement floor of this elevator, built for a live load of seventy-five pounds, has been loaded over almost its entire surface from 300 to 3050 pounds per square foot, frequently in seven days after being placed, and that in midwinter.—Mr. Neher in Proceedings of Engineers' Society of Western New York.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Savannah, Ga.—Mayor Myers stated recently that the street paving account of 1901 is overdrawn. The appropriation this year for paving was $20,000, and the city has only $22,267.06 to collect form owners of abutting property on the streets that have been paved. As the expenditure thus far has been $44,929.49, the account is overdrawn $2,662.43.

Omaha, Neb.—A restraining order has been secured against the city of Omaha and the Board of Public Works to prevent the city officials from proceeding with the proposed paving repairs on N. Sixteenth-st. The petition claims that the city has no authority to take money from the general fund to pay for repairs on street paving after the expira-

tion of a five year guarantee, but that the money must be assessed against the property owners.

CONTEMPLATED WORK.

Paris, Ky.—Asphalt paving is proposed.

Wausau, Wis.—Paving is contemplated for Muenchow-st.

Savannah, Ga.—Brick paving is proposed for W. Broad-st.

Geneseo, Ill.—A granitoid walk on Main-st. is contemplated.

Crookston, Minn.—The street paving question is being discussed.

La Salle, Ill.—About two and one-half miles of brick paving has been ordered.

Marinette, Wis.—Bids will be asked for paving Main-st. with brick.

Baraboo, Wis.—Ash-st. between Fourth and Eleventh-sts. will be paved.

Everett, Mass.—Edith-st. will be improved at a cost of $8,500.

McComb, O.—A resolution has been passed to macadamize Liberty-st.

Adrian, Mich.—Plans for macadamizing Michigan-st. have been adopted.

Ogden, Utah.—Paving has been ordered for Washington-ave. Mayor Jones.

Cripple Creek, Colo.—Macadam paving is contemplated for several streets.

Albany, N. Y.—Brick paving is proposed for Robin-st. and Sheridan-ave.

Tipton, Ia.—The cost of asphalt and brick paving is being considered.

Waterloo, Ia.—Brick paving is contemplated for two blocks of College-st.

Paducah, Ky.—Paving is proposed for N. Ninth-st. and Harrison-st. Mayor Lang.

San Francisco, Cal.—Ordinances for improvements in several streets have been passed.

Groton, Conn.—This town voted, July 15, to expend $4,500 for road improvements.

Maryville, Mo.—This city voted, July 9, to issue $30,000 bonds for street paving.

Leavenworth, Kas.—An ordinance has been adopted for paving Fourth-ave. with asphalt.

Allegheny, Pa.—Ordinances for regrading and paving seventy-five streets have been passed.

White Plains, N. Y.—This town voted, July 16, to issue $75,000 bonds for road improvements.

Austin, Tex.—An ordinance was passed July 14 providing for permanent street improvements.

St. Louis, Mo.—The reconstruction of seven streets and twelve alleys has been recommended.

New Haven, Conn.—Church-st., between Elm and Chapel, will be paved with Trinidad Lake pitch asphalt.

Iowa City, Ia.—Brick paving is proposed for College-st. Final action will be taken Aug. 2.

Kenosha, Wis.—Bids will be asked for at once for paving Milwaukee-ave. Cy. engr. Moth.

Battle Creek, Mich.—This city voted July 1 to issue $15,000 bonds for new paving.

Dana, Ind.—The construction of concrete walks on the principal streets is contemplated.

Chatfield, Minn.—New sidewalks have been ordered for several streets. Mayor Cooper.

Atchison, Kas.—Contracts for paving Laramie and Atchison-sts., will be let in August.

Reynoldsville, Pa.—Brick paving is contemplated for Fourth-st., from Grant to Jackson.

Madison, Wis.—Council is urged to pave the streets around the Capital Square with asphalt.

Quincy, Ill.—Second-st., from Maine to Broadway, 1,348 ft., will be paved with brick this year.

Denver, Col.—Bids for macadamizing Eighteenth-ave., will probably be advertised for at once.

Eaton Rapids, Mich.—The question of paving Main-st. with block is urged by the press.

Newport News, Va.—The question of issuing $100,000 bonds for street paving will be voted on.

Rochelle, Ill.—Plans and specifications for cement walks are being considered. H. W. Smart, cy clk.

Muskegon, Mich.—The question of repaving Jefferson-st. with brick is being considered. Mayor Moore.

Macon, Ga.—The question of paving Mulberry-st., from Second to Spring, is being considered.

Hartford City, Ind.—The city clerk has been directed to ask for bids for improving Grant-st.

Peru, Ill.—Petitions have been circulated for eleven blocks of paving on Peoria and Putnam-sts.

Terre Haute, Ind.—A petition is being circulated for paving S. Third-st., from Poplar to Osborne.

Manchester, Mass.—The question of appropriating $9,000 for macadam roads has been favorably voted on.

Youngstown, O.—Ordinances have been passed for paving Market-st. and Wick-ave. and improving Central-square.

Minneapolis, Minn.—Asphalt paving is proposed for Sixth-st., between Hennepin-st. and First-ave., N.

Deep River, Conn.—The sum of $9,000 has been appropriated for extending the macadam road to the Essex line.

Syracuse, N. Y.—An ordinance has been adopted providing for brick or macadam paving on W. Kennedy-st.

Cairo, Ill.—The property-owners on Fifteenth-st., between Commercial-ave. and Poplar-st. have petitioned for a permanent brick walk. Mayor Wright.

Savannah, Ga.—The property-owners on Whitaker-st. filed a petition July 23 asking for vitrified brick paving.

Rockford, Ill.—A petition is being circulated asking that Fourth-ave., between Seventh and Eleventh, be macadamized.

Maryville, Mo.—Resolutions have been passed, according to press reports, for 41 blocks of vitrified brick paving.

Beardstown, Ill.—The street committee has recommended the purchase of 100,000 crossing brick. Mayor Keil.

Champaign, Ill.—A petition is being circulated asking that Springfield-ave., between Neil-st. and Prospect-ave., be paved.

Galesburg, Ill.—The sidewalk committee has recommended the construction of sidewalks in a number of streets.

Owensboro, Ky.—Mayor Small has been in-

structed to advertise for bids for constructing certain concrete sidewalks.

Maryville, Mo.—A petition is being circulated asking for paving Main-st. and S. Main-st. with gravel or macadam.

Middletown, O.—The clerk has been directed to readvertise for bids for brick paving on Middle alley. Engr. Doty.

Cincinnati, O.—The question of repaving Fourth-st., from Broadway to Central-ave., with asphalt is being agitated.

Fowler, Ind.—The town clerk has been directed to ask for a mile of cement walks, according to press reports.

Sedalia, Mo.—An ordinance was passed July 15 providing for brick, stone or concrete sidewalks. Mayor Babcock.

Arcola, Ill.—Ordinances were passed July 12 for building about one mile of new sidewalks and eleven concrete crossings.

Phoenix, B. C.—Mayor G. W. Rumberger has completed arrangements for securing a temporary loan of $10,000 for improving the streets.

Fulton, N. Y.—The committee appointed to investigate the question of paving material for First-st. reported in favor of brick.

Atlantic City, N. J.—An ordinance was passed July 15 providing for the expenditure of $98,000 for paving 20 streets and avenues.

Lowell, Mass.—The aldermen have voted in favor of a loan of $55,000 for smooth paving on portions of Broadway and Suffolk-sts.

Westerville, O.—The question of issuing bonds for street improvements, sewers and water works will be voted on Aug. 19.

Racine, Wis.—Resolutions were adopted July 15 for paving Sixteenth-st., from Grand-ave. to Mead-st., with brick. Mayor Higgins.

Green Bay, Wis.—A resolution has been adopted providing for a macadam paving on Jefferson and Porlier-sts. Mayor Murphy.

Chicago, Ill.—Asphalt, brick and macadam paving have been ordered for several streets at an estimated cost of $222,709.

St. Paul, Minn.—The specifications for paving Eighth-st., from Broadway to Kittson, have been changed from brick to sandstone.

Sioux City, Ia.—A resolution was passed July 23 ordering the construction of asphalt pavement on Douglas-st., from Sixteenth to Eighteenth.

Omaha, Neb.—An ordinance passed second reading July 16 for paving Harney-st., between Fifteenth and Twentieth. Mayor Moores.

Joplin, Mo.—Resolutions have been approved for macadamizing Sergeant and Moffett-aves. John C. Trigg, mayor; E. C. H. Squire, cy. clk.

Lowell, Mass.—The committee on streets voted July 8 to recommend a loan of $15,000 for macadamizing Nesmith and Rogers-sts. Mayor Dimon.

Chicago, Ill.—The board of local improvements decided July 25 to pave Lincoln-st. between Harrison and Twelfth, with asphalt instead of brick.

Leavenworth, Kas.—Ordinances were passed July 10 to pave Third-st., from Cherokee to Walnut, with brick. Chmn. Bauserman, of cy. coun.

Conneaut, O.—Resolutions have been passed providing for brick paving on Broad, Sandusky and Buffalo-sts. W. F. Stanley, mayor; J. L. Risley, clk.

Clearfield, Pa.—The question of issuing $12,354.57 for street paving and extending the stone walk along the river front will be voted on Aug. 3.

Atchison, Kans.—Resolutions have been adopted providing for brick paving on Atchison and Kearney-sts. and Fifth and Kansas-aves. Fred Giddings, cy. engr.

Tacoma, Wash.—The commissioner of public works has been authorized to pave S. East-st., from Eleventh to Thirteenth, with asphalt. Prest. Smith, of coun.

Sterling, Ill.—The question of issuing bonds to the amount of $3,000 or $5,000 for the construction of permanent sidewalks is under consideration.

Milwaukee, Wis.—Granite paving will be constructed on Thirteenth-st., from Clybourne to St. Paul-ave., instead of brick, as originally intended.

Cambridge, Mass.—A resolution has been passed ordering Commercial-ave to be widened between Bridge-st. and the dock, 2,03s sq. yds. Edward J. Brandon, cy. clk.

Henderson, Ky.—Ordinances were passed July 18 for improving Adams-st., for brick walks on Ingram, First and Main-sts., and vitrified brick gutters on Main-st.

Los Angeles, Cal.—The city engineer has been instructed to prepare a map for the proposed improvement of Orange-st., including cement walks, from First to Eighth.

St. Joseph, Mo.—An ordinance was introduced July 21 providing for the construction of sidewalks on both sides of Seventeenth-st., from Messanie to Olive.

Worcester, Mass.—Main-st., from Lincoln square to Chandler-st., will be paved with granite blocks laid in cement. Mayor O'Connell; F. A. McClure, cy. engr.

Ogden, Utah.—A. F. Parker, cy. engr., was directed, July 22, to perfect his plans and specifications for paving and report to the council as early as convenient.

Colorado Springs, Col.—A plan for paving the streets with disintegrated granite is being considered by Mayor Robinson and the business men of this city.

Peoria, Ill.—Asphalt paving is proposed for Arcadia-ave., from Knoxville-ave. to Glen Oak, three-quarters mile. An ordinance has been introduced for paving E. Bluff-st with brick.

Annapolis, Md.—At a joint meeting of the city council and the permanent improvement commission, July 23, it was decided to pave Gloucester-st. with vitrified brick.

Winnipeg, Man.—Bids have been authorized for asphalt paving on Elgin-ave. and Princess-st.; macadam on Dagmar; boulevarding a number of streets; granolithic walk on Edmonton-st. Mayor Arbuthnot.

Omaha, Neb.—Ordinances are pending in South Omaha providing for the establishment of improvement districts on A, B, C, D and E-sts., from 23d to 24th and for laying permanent sidewalks.

Red Oak, Ia.—Mayor Griffith, C. J. Beckwith and W. S. Ellis have been appointed a committee to investigate materials and receive bids for paving Coolbaugh-st., between Fourth and Fifth.

Albany, N. Y.—Ordinances were signed by Mayor Blessing July 23 for paving with

brick Livingston-ave., between Watervliet-ave. and Rawson-st.; Perry-st., between Western and Central-aves.

Windsor Locks, Conn.—This town, Milford, Clinton, Manchester, Orange, Seymour, South Manchester, West Haven, West Hartford and East Hartford, have voted to expend $9,000 each for good roads.

Davenport, Ia.—Objections will be heard Aug. 7 to the proposed paving of Parry-st., from Kirkwood boulevard to Eighteenth-st. and an alley with brick on concrete. Albert J. Smith, cy. clk.

Takoma Park, D. C.—The street committee has recommended the construction of more substantial walks and the graveling or macadamizing of the streets. The question of purchasing a stone crusher is under consideration.

Mobile, Ala.—J. H. Hazlehurst, ch. engr., has filed plans, profiles and estimates of the cost of paving with asphalt, vitrified brick and granite block on concrete foundation, Water-st., St. Louis and Government-sts.

Springfield, Mo.—Resolutions have been passed for paving Market, Lincoln, Mt. Vernon, College and Campbell-sts. with hard pan on broken stone foundation. Ralph Walker, mayor; G. W. Hackney, cy. clk.

Erie, Pa.—An ordinance was passed July 15 providing for stone paving on Ash-st. The report of the street committee, to the effect that if State-st. is paved with asphalt the gutters be paved with brick, was adopted.

Cincinnati, O.—The city engineer was directed July 16 to report a resolution and specifications for repaving Harrison-ave., from the C., H. & D. railroad tracks to Westwood-ave., and Eggleston-ave., from Broadway to Pearl, with granite.

Scranton, Pa.—Ordinances have passed third reading for paving Washburn-st., from Summer-ave. to Van Buren-ave., with vitrified brick on concrete, and Olive-st., from Adams to Madison-ave., with asphalt on concrete.

Depew, N. Y.—The village engineer has been directed to prepare plans and specifications for paving and curbing Calumet and Sanilac-sts. A petition has been submitted to the board of village trustees asking that Penora-st. be paved.

Lafayette, Ind.—The city engineer was directed July 23 to prepare an ordinance and specifications for paving an alley with brick on concrete base, and for cement walks on Alabama-st., from Fourteenth to Main. Mayor Justice.

St. Paul, Minn.—The board of public works has been directed to ask for bids for asphalt paving, under the city council's new specifications, for portions of Minnesota, Minnehaha, S. Wabash, Decatur and Beaumont-sts. City Engr. Claussen.

Kansas City, Mo.—Ordinances have been passed providing for the paving of Agnes-st., betwen Howard and Twenty-sixth, and alley between Locust and Cherry, from Fourteenth to Fifteenth; Kansas-ave., between Belt line railway and Benton Boulevard; Brooklyn, between Thirty-first and Linwood; constructing walks in large number of streets. Paving was also declared necessary for portions of Independence and Chestnut-sts.

San. Francisco, Cal.—Final action will be taken Aug. 9 on the resolution providing for paving Sacramento-st., betwen Gough and Octavia-sts., with basalt blocks, and for macadamizing Twentieth-ave., between H and I-sts. J. Leo Park, secy. B. P. W.

Terre Haute, Ind.—The property-owners on Poplar-st., from Sixth to the E. & T. H. railroad, have petitioned the board of public works to pave the thoroughfare with whatever kind of material the board may select. The property-owners on S. Third, from Poplar to Osborne, have petitioned for paving and concrete walks.

Indianapolis, Ind. — Resolutions were adopted July 25 for the following improvements: Paving Cora-st. with brick on concrete; graveling second alley south of Tenth-st. from Jefferson-ave. to first alley west; graveling Fernway-ave. from Winter-ave. to Greenbriar Lane; paving Vermont-st. from Noble to East with creosoted wooden blocks on concrete; Tenth-st. from Rural to Olney, brick on concrete; Adelaide-st., brick on concrete; graveling Temple-ave. from Tenth to Thirteenth; first alley north of Georgia-st. on Meridian, brick; cement walks on McCarty-st. from East-st. to Virginia-ave., cement walks on McLain-st. from Morris to Harvard; brick paving in first alley west of Meridian, on Georgia; brick paving part of Eden Place; cement walks on Temple-ave. from Eleventh to Thirteenth. Objections may be filed until Aug. 16. Albert Sahm, chm. B. P. W.

CONTRACTS TO BE LET.

Homestead, Pa.—Bids are asked until Aug. 5 for brick paving. A. P. Widson, cy. engr.

Lorain, O.—Sealed bids are asked until 12 m. Aug. 19 for improving Eighth-st. Cy. Clk.

Martinez, Cal.—Bids are asked until Aug. 13 for macadamizing six streets. M. H. Hurly, town clk.

Goshen, Ind.—Bids are asked until 7:30 p. m. Aug. 5 for building several sidewalks. Mayor Deahl.

New Ulm, Minn.—Bids will be received by the council until 5 p. m. Aug. 6 for grading several streets.

Madison, Wis.—Bids are asked until Aug. 15 for paving several streets. O. S. Norsman, cy. clk.

Garretson, S. D.—Bids are asked until Aug. 7 for grading several streets. J. H. Van Dewar, cy. audt.

Marion, O.—Bids are asked until Aug. 17 for 3,700 sq. yds. of brick or block paving. Ed S. Ault, cy. engr.

Canton, O.—Bids are asked until Aug. 12 for 3,900 sq. yds. of paving on North-st. Phil H. Weber, cy. engr.

Lexington, Mo.—Bids are asked until Aug. 12 for furnishing 500 perch of macadam. Louis Gratz, cy. register.

Oshkosh, Wis.—Bids are asked until Aug. 5 for grading and paving Jefferson-ave. Frank Monahan, chmn. B. P. W.

Park Ridge, Ill.—Sealed bids are asked until 8 p. m. Aug. 6 for building 6,000 ft. of sidewalk. Joseph Lalone, vil. clk.

Washington, N. J.—Sealed bids are asked until 12 m. Aug. 10 for macadamizing a road. C. E. Johnston, mayor.

Council Bluffs, Ia.—Sealed bids are asked until Aug. 5 for 35,000 sq. yds. of brick paving. N. C. Phillips, cy. clk.

Appleton, Wis.—Sealed bids are asked until Aug. 7 for 6,000 sq. yds. of asphalt paving. C. H. Gilfett, cy. engr.

Vailsburgh, N. J.—Bids will be received Aug. 20 for certain street improvements. Prest. Reynolds, of boro. com.

Moscow, Idaho—Bids will be received until Aug. 15 for paving Main and other streets with macadam. St. com.

Brainerd, Minn.—Bids are asked until 6 p. m. Aug. 5 for paving Seventh-st with stone and crushed rock. R. K. Whitely, cy. engr.

Preston, Minn.—Bids are asked until Aug. 6 for constructing 8,500 sq. ft. of Portland cement walks. J. F. Jones, co. audt.

Pittsburg, Pa.—Bids are asked until Aug. 5 for permanent improvements of Steubenville pike. W. E. Thompson, co. compt.

Sullivan, Ind.—Bids are asked until Aug. 5 for building 7 mls. of gravel road in Fairbanks twp. J. M. Lang, co. audt.

Elyria, O.—Sealed bids are asked until 12 m. Aug. 19 for improving West-ave., from Broad to Eighth-st. W. H. Park, clk.

Mansfield, O.—Sealed bids are asked until 12 m. Aug. 5 for improving E. Fourth-st. and Weldon-ave. F. M. Remy, cy. clk.

Tampa, Fla.—Bids are asked until Aug. 15 for 18,999 sq. yds. of brick paving with granite curbing. W. B. Henderson, prest. B. P. W.

Macomb, Ill.—(Special.)—Sealed bids will be received until 2 p. m. Aug. 7 for 24,000 sq. yds. of brick paving. Cephas Holmes, cy. engr.

Lebanon, Ind.—Sealed bids are asked until Aug. 6 for constructing a gravel road on turnpike. Benjamin F. Baker, engr.

Coraopolis, Pa.—Bids are asked until Aug. 5 for brick, flagstone or artificial stone sidewalks in several streets. H. W. Burns, chmn. st. com.

Huntington, Ind.—Bids are asked until Aug. 13 for 15,000 sq. yds. of brick paving on crushed stone foundation. Frank Guthrie, cy. engr.

Evansville, Ind.—Sealed bids are asked until Aug. 10 for paving several streets with asphalt and brick. W. E. Clarke, clk.

Logan City, Utah—Sealed bids are asked until Aug. 15 for building cement walks on Main and Second-sts., with curbing and guttering. Cy. recorder.

East Newark, N. J.—Bids are asked until Aug. 14 for 1,500 sq. yds. of brick paving and 5,450 sq. yds. of asphalt paving. Wm. Healey, boro. clk.

Indianapolis, Ind.—Sealed bids are asked until Aug. 2 for paving Scioto-st. with brick, and for cement walks in three streets. Albert Sahm, chm. B. P. W.

Havana, Cuba—Sealed bids are asked until 12 m. Sept. 25, for street paving. Lieut. W J. Barden, corps engrs., U. S. A., chief engr.; Miguel Gener, mayor.

Washington, D. C.—Sealed bids are asked until 12 m. Aug. 10, for laying cement walks in the District of Columbia. H. B. F. MacFarland, chmn. dist. com'rs.

Cleveland, O.—Sealed bids are asked until Aug. 14 for asphalt paving on concrete base, curbing, etc., on two streets. Chas. P. Salen, dir. pub. wks.

Toledo O.—Sealed bids are asked until 12 m., Aug. 5, for paving Empire-st., from Tremont-ave. to Thirteenth-st., with vitrified block or brick, Kreodone creosoted blocks or asphalt blocks. J. E. Connell, cy. clk.

Atlanta, Ga.—Bids are asked until Aug. 5 for asphalt paving on the business section of Whitehall-st., according to press reports. R. M. Clayton, cy. engr.

Birmingham, Ala.—Sealed bids are asked until 12 m, Aug. 7, for macadamizing, curbing, cement sidewalks and sewers in certain streets. Julian Kendrick, cy. engr.

Keokuk, Ia.—Sealed bids are asked until 12 m. Aug. 3, for macadamizing and guttering Orleans-st., from Eighth to Ninth. J. Ross Robertson, cy. engr.

Madison, Ind.—Sealed bids are asked until 10 a. m. Aug. 7 for building gravel roads. John F. Hammel, chmn. co. com'rs; Gam. S. Taylor, co. audt.

Chester, Pa.—Sealed bids are asked until 8 p. m. Aug. 5 for crushing about 2,000 perch of cobble and rubble stone. W. T. Cutlis, chmn. st. com.; Frank W. Harrison, cy. clk.

Mansfield, O.—Sealed bids are asked until Aug. 10 for constructing sidewalks in Park-ave., and for improving Sheridan-ave. and Orchard and Bowman-sts. F. M. Remy, cy. clk.

Kalamazoo, Mich.—Sealed bids are asked until Aug. 5 for furnishing this city with 2,500 sq. yds. of paving brick. Cornelius Verburg and Jacob Levy, com.

Wilmington, O.—Bids are asked until Aug. 15 and 16 for grading, graveling or macadamizing certain roads, and building necessary bridges and culverts. J. A. Brown, engr.

Valparaiso, Ind.—Sealed bids are asked until 11 a. m. Aug. 10 for building certain roads in Liberty township. John Bornholt, chmn. co. com'rs.; M. J. Stinefield, co. audt.

Hammond, Ind.—Sealed bids are asked until 8 p. m. Aug. 13 for paving Rimbach ave., from Hohman to State Line-st., with brick, with combined curb and gutter. Peter J. Lyons, cy. engr.

Plymouth, Ind.—Sealed bids are asked until 7:30 p. m. Aug. 15 for paving LaPorte-st., from Center to Plum, with vitrified brick, including curbing, draining, etc. Arthur E. Rhodes, cy. clk.

Seattle, Wash.—Bids are asked until Aug. 13 for 100 cu. yds. of excavation along the canal connections between Lake Union and Salmon Bay. Major John Willis of engr. corps.

Cincinnati, O.—Sealed bids are asked until Aug. 6 for brick paving on portions of Wingate alley and Sedam-st. Bids are asked until Aug. 23 for paving Gilbert-ave. with brick. George F. Holmes, clk. B. P. S.

Des Moines, Ia.—Sealed bids are asked until 10 a. m., Aug. 9, for paving W. Twenty-second-st., from Cottage Grove to University-ave., with asphalt on concrete base, with Portland cement curb and vitrified brick gutters. Bids are asked until Aug. 12 for grading W. Twenty-second-st. G. A. Eberhart chmn. B. P. W.

Salt Lake City, Utah.—Sealed bids are asked until 10 a. m., Aug. 2, for paving Second South and Third South-sts., including the following: 13,000 cu. yds. grrading, 10,500 lin. ft. curbing, 11,500 sq. yds. stone block paving, 32,000 sq. yds. asphalt paving. J. E.

Dooly, chmn. B. P. W.; L. C. Kelsey, cy. engr.

Wapakoneta, O.—Sealed bids are asked until 12 m., Aug. 2, for paving Auglaize-st., from the C., H. & D. R. R. to Wood-st., with brick or block, including the following 5,269 cu. yds. exca., 8,786 sq. yds. gravel concrete foundation and cushion, 8,786 sq. yds. brick paving, 3,618 ft. straight curb, 75 ft. of 4-ft. circular curb, 3,256 ft. 15, 12, 10, 6-in. sewer pipe, 22 T's 6x12, 4 T's 10x12, 40 T's 6x15, 9 curves, 10-in., 62 6-in. stoppers, one 12-in. stopper, one 15-in. stopper, one manhole, 15 catch basins, 629 ft. retaining curb. Charles E. Fisher, vil. clk.; Samuel Craig, engr.

CONTRACTS AWARDED.

Republic, Wash.—The contract for building sidewalks on Clarke-ave. was awarded to Lee Dysart.

Charleroi, Pa.—Hastings & Owen secured a contract for paving seven streets for about $33,000.

Laporte, Ind.—The contract for street paving was awarded, July 16, to Schneider & Son of Michigan.

Auburn, N. Y.—The contract for paving Genesee-st. was awarded to Geo. F. Adams, who will use Mack paving blocks.

Hastings, Mich.—The contract for 1,000 sq. yds. of tile cement walks was awarded to the St. Paul Stone company.

Helena, Mont.—The contract for grading and parking Sixth-ave. was awarded to John Adami & Co. for $3,967.80.

Owensboro, Ky.—The contract for building concrete walks on Fredonia-st. was awarded to H. A. Lensing.

Owensboro, Ky.—John Tropp of Dayton, Ky., was awarded the contract for macadam paving for $54,000.

Coudersport, Pa.—Bids were received July 10 for brick paving, the prices ranging from $1.63 to $2.60 a sq. yd.

Warren, N. Y.—The contract for street paving was awarded to Mahoney Bros. & Gardner of Jamestown for $24,000.

Shreveport, La.—The contract for paving Market-st. with vitrified brick was awarded, July 9, to Chatwin Bros.

Hillsdale, Mich.—The contract for paving Howell-st. with brick was awarded to H. P. Streicher of Toledo, O., for $12,346.

Volga, S. D.—The contract for building cement walks in the business streets was awarded to Olof Johnson of Brookings, S. D.

Frankfort, Ind.,—The contract for paving Clinton and Jackson-sts. with brick was awarded to John F. Bretz of Springfield, Ill.

Worthington, Minn.—The contract for a cement walk on two sides of the court house park was awarded to E. W. Cutler at $1.24 a sq. yd.

Sioux City, Ia.—Bids were received July 16 for brick paving. M. L. Flinn bidding $2.05 and Hanson Bros. $1.97 a sq. yd. The bids were referred.

Terre Haute, Ind.—The contract for paving Cherry-st. with creosoted wooden blocks was awarded to Wade, Erler & Peters of this city.

Champaign, Ill.—The contract for paving W. Green-st., from State-st. to Prospect-ave., was awarded to Thompson & Case of Peoria, Ill.

South Bend, Ind.—W. N. McSherry was awarded the contract for cement walks on Harris-st. at 8 cts. a sq. ft.; curbs, 18 cts. a lin. ft.; grading, 15 cts. a cu. yd.

Lee, Mass.—The contract for laying 50,000 sq. ft. of concrete walks was awarded to Gilbert A. Booth & Son of Pittsfield, Mass., for $4,500.

Columbus, O.—The contract for repairing Woodland-ave., from Broad to Atcheson, has been awarded to N. B. Abbott for $20,300.48.

Peru, Ind.—The contract for paving Broadway-st. was awarded C. E. Moellering & Co. of Ft. Wayne, Ind., at $1.75 a sq. yd. for Metropolitan block.

Des Moines, Ia.—Special.—The contract for constructing 4,332 sq. yds. of brick paving was awarded to J. C. Likes of this city at $1.68 a sq. yd.

Sparta, Wis.—The Western Granite Paving company of Chicago was awarded the contract for constructing a granite macadam street in this city for $21,098.

New York City—The contract for paving Broadway, from Canal to Fourteenth-sts., was awarded July 9 to the Barber Asphalt Paving company at $5.69 a sq. yd.

Macon, Ga.—W. M. Laslie, representing the Chattanooga Brick company, has been awarded the contract for paving Mulberry-st., from Second to Spring with brick.

Benton Harbor, Mich.—The contract for paving Wall, Sixth and Pleasant-sts. with asphalt was awarded to the Barber Asphalt Paving company at $1.94 a sq. yd.

Denver, Col.—The Bermudez Blake Construction company of this city was awarded the contract for paving Grand-ave. with macadam at 75 cts. a sq. yd.; total, $42,627.

Muskegon, Mich.—The contract for paving Peck-st. was awarded July 5 to the Luten Engineering and Construction company of Grand Rapids. Metropolitan block will be used.

Denver, Col.—The contract for paving Colfax-ave., from Detroit-st. to the Colorado boulevard with asphalt was awarded to the Colorado Paving company for $50,497.30.

Elwood, Ind.—The contract for 5 mi. of brick paving was awarded, according to press reports, to W. W. Hatch & Sons of Lafayette and C. C. DeHority of this city.

Grand Rapids, Mich.—Contracts were awarded July 19 as follows: Macadamizing N. Lafayette-st., Chas. Connell, $3,740.50; improving S. Fuller-st., David W. Boyes, $5,495.

Port Huron, Mich.—The contract for macadamizing Lincoln-ave. and Fifteenth-st. has been sold to Warren Bros. of Boston, who will construct their tar macadam pavement.

Gardner, Mass.—A. J. Wellington of Boston has been awarded the contract for building a section of state highways in this town for $3,624 and in Truro for $2,876.

St. Paul, Minn.—The R. F. Conway company of Chicago submitted the lowest bid, July 8, for paving Western and Marshall-aves. and Central Park-place with asphalt at $1.77 a sq. yd.

Leavenworth, Kas.—Chapin & Greever of this city secured the contracts for paving Third-st., from Choctaw to Walnut, with

Pittsburg brick at $1.43¾, and from Cherokee to Choctaw with Leavenworth brick at $1.51½ a sq. yd.

Binghamton, N. Y.—(Special.)—Henry Wards says that the contracts for paving Oak, State and Susquehanna-sts were awarded to Wm. A. Park at $1.84 a sq. yd. for Park brick.

Moline, Ill.—The contract for 15,400 sq. yds. of brick paving on Fifth-ave., from Seventeenth to Twenty-sixth-st., was awarded to the Walsh Construction company of Davenport, Ia., for $24,262.

Quincy, Ill.—Grading contracts have been awarded as follows: Lind-st, 13½ cts. a cu. yd., Kordsiemon; Kentucky, 11 9-10 cts., Ebert & Shanahan; Thirteenth-st., 17 cts., Henry Rees.

Sioux Falls, S. D.—John Johnson was awarded contracts for building cement walks in dists. No. 1 and 2 at 12 cts. a sq. ft., and Miracle & Miracle in dist. No. 3 at 13 cts. a sq. ft.

Indianapolis, Ind.—The Barber Asphalt Paving company was awarded the contract, July 10, for asphalt paving in Massachusetts-ave., from Pennsylvania to Delaware, at $4 per ft. each side.

Meriden, Conn.—The contract for constructing 3,130 sq. yds. of asphalt paving was awarded to the Central Asphalt Paving company at $2.98 a sq. yd.; new curbs, 88 cts. a lin. ft.; old curb, 53 cts.

Hartford, Conn.—The contract for paving Pearl-st. was awarded to the Hartford Paving & Construction company at $2.05 a sq. yd. for asphalt blocks and 35 cts. a sq. yd. for laying.

Racine, Wis.—The contract for paving Sixth-st. with brick, from Grand-ave. to Mead-st., was awarded, July 20, to John O. Jones at $1.34 a sq. yd. and 50 cts. a lin. ft. for curbing.

Boone, Ia.—The contract for paving Seventh and Allen-sts. with brick, 3,500 sq. yds., was awarded to Wm. Palmer and E. Samuelson of this city at $1.78 a sq. yd., or $6,725.75.

Spencer, Ind.—Geo. R. Babbs secured the contract for sidewalks and curbing on Main and N. Montgomery-sts. at the following prices: Walks, 11 cts. a sq. ft.; curbing, 33 cts. a lin. ft.; round corners, 66 cts.

Niagara Falls, N. Y.—Paving contracts were let July 19 as follows: Cedar-ave., $11,142.52, and Seventh-st., $11,135.36, American Contracting company; Elizabeth-st., $10,336.35, Barber Asphalt Paving company.

Muscatine, Ia.—Fuller Bros. of this city secured the contract for brick paving in district No. 19 at $1.06½ a sq. yd. for Buffalo brick; excavation, 20 cents; street curb, 46 cents; alley curb, 38 cents; total, $29,280.

Allegheny, Pa.—The Atlas Construction company was awarded the contract July 12 for paving the Brighton road for $194,920. The Wadsworth Stone and Paving company secured the contract for resurfacing and repaving old walks in the parks.

Kansas City, Mo.—The contract for paving Benton boulevard, from Thirty-first-st. to Linwood boulevard, was awarded July 17 to McTernan & Halpin, and for curbing Linwood, from Benton to Michigan, to Kansas City Construction company.

Mason City, Ia.—The Barber Asphalt Paving company was awarded the contract for asphalt paving on Washington-ave. and Slater-st. at $1.98 a sq. yd. The contract for paving Main-st. with brick was awarded to J. H. Killmar of Des Moines at $1.96 a sq. yd., and 37 cents a lin. ft. for curb.

Omaha, Neb.—The Grant Paving company was awarded a contract July 16 for repairing N. Sixteenth-st. and other down-town streets for $15,000. Charles E. Fanning has been awarded brick paving contracts at $1.75 for new paving and $1.30 for repaving; stone block, Hugh Murphy, $2.20 for new and $1.65 for repaving.

Buffalo, N. Y.—The contract for repaving Seventh-st., from Connecticut to Vermont, and from Rhode Island to Front-ave., with asphalt was awarded to the Warner-Quinlan Paving company for $7,595; repaving Ohio-st., between Dead creek and Michigan-st., Interstate Paving company, $14,000.

Brooklyn, N. Y.—Contracts for repaving certain streets in this borough with asphalt have been awarded as follows: Cranford & Co., 12 streets, and repairing various streets with asphalt; Eastern Bermudez Asphalt Paving company, 5 streets; Uvalde Asphalt company, 6 streets; Brooklyn Alcatraz Asphalt company, 4 streets.

Marion, Ind.—Paving contracts have been awarded as follows: Improving D-st., L. C. Lillard, $4.62 a lin. ft.; improving W. Second-st., $7.47 a lin. ft.; macadam paving, A-st., Robt. J. Spencer, $5.31; building walks on Thirtieth-st., Chas. Vermillion, 60 cts. a lin. ft.; walks on Flinn-st., Wm. Yates, 42½ cts. a lin. ft.

Toronto, Ont.—Paving contracts were awarded July 10 as follows: Constructing and paving company, asphalt paving in Howland-ave., $11,600; macadam paving in Huron-st., $3,589; brick paving in Springhurst-ave., $6,496; Dominion Paving and Contracting company, macadam paving in Parliament-st., $2,871; W. Grant & Co., brick paving in Stewart-st., $3,690.

Milwaukee, Wis.—The Western Paving and Supply company secured contracts July 5 as follows: Kinnickinnic-ave., from Clinton to Mitchell-st., and Clinton-st., from Greenfield-ave. to Mitchell-st., 9,621 sq. yds., $2.21 a sq. yd.; Wells-st., from Thirteenth to Fifteenth, 3,344 sq. yds., $2.23 a sq. yd. The Barber Asphalt Paving company secured the contract for paving State-st., from Third-st. to the Milwaukee river, 813 sq. yards., at $2.25.

Aurora, Ill.—(Special.)—Paving contracts were awarded July 18 to the R. F. Conway company of Chicago as follows: New York-st., 16,075 sq. yds. of asphalt, $1.74 a sq. yd., and 1,041 sq. yds of brick, $2.00; View-st., 13,216 sq. yds. of asphalt, $1.69 a sq. yd. The other bids received for this work were as follows: New York-st., Jos. J. Duffy & Co., $1.73 for asphalt and $2.05 for brick; Ayers Asphalt company, $1.79 and $1.50; Western Paving and Supply company, $1.76 and $1.61; Barber Asphalt Paving company, $1.99 for each. View-st., asphalt, Jos. J. Duffy & Co., $1.73; Ayers Asphalt company, $1.77; Western Paving and Supply company, $1.74; Barber Asphalt Paving company, $1.97.

Newark, N. J.—Bids for asphalt paving were received July 11, as follows: Barber Asphalt company, Brunswick-st., $15,112; Hampden-st., $2,032; Monroe-st., $15,235; Blum-st., $5,357; Milton-st., $2,118; Hunterdon-st., $7,694; Orleans-st., $3,196; Park-st.,

$2,959. Essex Asphalt and Contracting company, Brunswick-st., $15,086; Hampden-st., $2,155; Monroe-st., $15,650; Blum-st., $5,738; Milton-st, $2,252; Hunterdon-st., $7,842; Orleans-st, $3,424; Park-st., $3,164.

Albany, N. Y.—Contracts for building state roads have been awarded, acording to press reports, as follows: Thos. H. Karr of Troy, Troy & Brunswick road,section 2, three miles long, for $25,800, and Hoag's Corners road, three miles, for $9,450; to E. & J. E. Martin of Utica, Waterford road, section 1, one and one-half miles, for $10,700; also section 2 of same road, five miles long, for $32,900; to Chambers & Casey, Rochester, Fairport road No. 60, 3.03 miles, for $32,400; to Whitmore, Rauber & Vicinus of Rochester, Pittsford road No. 61, 1.30 miles, for $13,200; to Henry Richards of Dover, for Chenango River road, 1.76 miles, for $14,800.

New York City—Bids were received for asphalt block paving in three streets, July 16. The Abbott-Gamble Construction company, 41 Park Row, bid $2.46 a sq. yd. for W. Eighty-eighth-st, $2.55 for Edgecombe-ave., and $2.74 for E. One hundred forty-first-st. The Hastings Pavement company, 25 Broad-st., bid $2.56, $2.48 and $2.67 respectively. These prices do not include foundation, curbing, etc. Bids were received July 16 for asphalt repaving, the Barber Asphalt company submitting the lowest bids on three of the largest contracts, as follows: University-place, 7,900 sq. yds. of asphalt, including binder, $3.79 a sq. yd.; 7,920 sq. yds. stone pavement relaid, 55 cents; 2,060 ft. new curb, $1.05; 360 ft. old curb, 49 cents. Lexington-ave., 3,650 sq. yds. asphalt, $3.52; 2,960 sq. yds. stone pavement relaid, 55 cents; 100 cu. yds. concrete, $6.75; 1,150 ft. new curb, $1.05; 25 ft. old curb, 49 cents. Fifty-seventh-st., 5,840 sq. yds. asphalt pavement, $2.65; 5,880 sq. yds. stone pavement relaid, 47 cents; 2,150 ft. new curb, $1.05; 120 ft. old curb, 49 cents.

SEWERS.

Madison, Wis.—The sewage was turned into the new septic tanks July 1.

Hackensack, N. J.—The Hackensack meadows company, recently incorporated, proposes the drainage of the Hackensack meadows by surrounding the marsh lands which amount to 3,393 acres, with a system of dykes or levees and to keep the interior drained by pumping. The levees will be wide enough to hold warehouses, and the interior will be converted into sites for factories, etc. A belt railway and docks on the Hackensack & Passaic river are involved in the plan.

CONTEMPLATED WORK.

Simsbury, Conn.—A sewer 4,000 ft. long is contemplated.

Quincy, Ill.—Sewers will be constructed in Second-st. this year.

Green River, Wyo.—Estimates are being prepared for a sewerage system.

Albany, Ore.—Resolutions have been passed ordering sewers in two blocks.

Paris, Ky.—A sewerage system is contemplated, according to press reports.

El Paso, Tex.—City Engineer Wimberly is in favor of the installation of a sewage purification plant

Blue Earth, Minn.—The question of sewer extensions is being considered.

Albany, Ore.—Resolutions have been passed for sewers in two blocks.

Irvington, Ind.—The construction of a sewerage system is proposed.

Cambridge, Mass.—A sewer in Bolton-st. is proposed. Edward J. Brandon, cy. clk.

Lynn, Mass.—An order for a brick sewer in Chestnut-st. has been adopted. Mayor Shepperd.

Grand Forks, N. D.—The construction of a 5 ft. brick sewer in Grigg-st. is contemplated.

Elyria, O.—The need of a new and better sewerage system becomes more apparent every day.

Joplin, Mo.—The city engineer has been instructed to ask for bids for a sewer in Fourth-st.

Edwardsville, Ill.—A sewerage system will be built for the suburb of Leclaire.

Oakland, Cal.—Resolutions have been adopted ordering sewers in a number of streets.

Hartford, Conn.—A resolution is pending providing for a 24-in. tile sewer in Albany-ave.

Whitinsville, Mass.—The question of building a sewage disposal plant is being considered.

Lancaster, O.—The city clerk has been directed to ask for plans for a sewage disposal plant.

North Tonawanda, N. Y.—The extension of Ironton's sewerage system is being considered.

Souderton, Pa.—A 15-in. sewer in Main-st. from Church-st. to Central-ave. is contemplated.

Burlington, Ia.—The city engineer has been directed to prepare plans for a sewer on Summer-st.

Atchison, Kas.—Estimates are being prepared for sewers in South Atchison. Fred Giddings, cy. engr.

Oelwein, Ia.—The construction of sewers in certain streets is contemplated. H. V. Hoyer, cy. clk.

Canon City, Col.—The construction of a number of sewers is contemplated. L. C. Hall, cy. engr.

Bird Island, Minn.—The question of issuing $3,500 sewer bonds has been favorably voted on.

Scranton, Pa.—The construction of a sewerage system at a cost of about $1,000,000 is proposed.

Melrose, Mass.—The sum of $25,000 has been appropriated for building sewers and surface drains.

Florence, Col.—City Engineer McFall will complete plans for a new sewerage system by Aug. 1.

Armstrong, Ia.—Final action on the proposed construction of a sewerage system will be taken Aug. 22.

Allentown, Pa.—Various methods of sewage disposal are being investigated by the sanitary sewerage commission.

Sterling, Ill.—The residents on Ninth-st., between C and D, are agitating the question of building a sewer.

Martinez, Cal.—The question of establishing a sanitary district in Richmond will be voted on Aug. 16.

Berkeley, Cal.—Ordinances for about 800

ft. of sewers have been adopted. Thomas E. Thomas, town clk.

Akron, Ia.—The Tribune says the question of building a sewerage system is certain to come up soon.

Battle Creek, Mich.—A resolution has been passed providing for a sewer on Garrison-ave. and Orchard-ave.

Terrell, Tex.—The New Orleans Sewerage company has been incorporated to construct and operate a sewerage system.

Albany, N. Y.—Mayor Blessing signed an ordinance July 23 for building sewers in Ontario and Seneca-sts.

Cadillac, Mich.—Plans and specifications for a lateral sewer on Bremer-st. have been adopted. W. J. Smith, cy. clk.

Carthage, Mo.—An ordinance has been passed providing for the construction of a sewer in district No. 2. R. Lundy, cy. clk.

Sherbrooke, Que.—A resolution has been passed providing for the completion of the sewerage system at a cost of $16,000.

Saratoga Springs, N. Y.—Plans for a sewage disposal plant will be submitted about Aug. 15. J. S. Mott, vil. engr.

Wilkinsburg, Pa.—The construction of storm water sewers has been recommended by Frease & Sperling, borough engrs.

Winchester, Ind.—A resolution has been adopted providing for sewers in the eastern and western parts of this city.

Metropolitan (L. I.), N. Y.—Preliminary measures for the construction of sewers in a number of streets have been adopted.

Windsor, Vt.—The village trustees have been authorized to issue $6,000 bonds for constructing a new trunk sewer.

Reynoldsville, Pa.—An ordinance has been passed for constructing a sewer along Pitch Pine Run and Mill-st. C. Mitchell, ch. Burgess.

Edwardsville, Ill.—A committee has been appointed to decide on a plan for improving the streets and constructing a sewerage system.

Greenville, N. C.—The plans and specifications for a sewerage system, prepared by J. L. Ludlow of Winston, have been accepted.

Biwabik, Minn.—A petition has been submitted to the village council asking for the construction of a sewerage system.

Bristol, R. I.—The sewer committee has been authorized to extend the sewerage system, and $47,000 was voted for the purpose.

Swissvale, Pa.—An ordinance was introduced July 15, authorizing the advertisement of bids for sewers in sections 2, 3 and 6.

Perth Amboy, N. J.—Application has been made to the state sewerage commission for the approval of plans for a sewage disposal plant for this city.

San Diego, Cal.—The city engineer has been directed to prepare plans and estimates for a sewerage system for University Heights addition.

Knoxville, Ia.—W. C. Mentzer, John Bates and A. O. Anderson have been appointed a committee to investigate the cost of building a sewerage system in this town.

Pueblo, Col.—Specifications for a combined storm and sanitary sewerage system will be considered Aug. 5, according to press reports. Wm. Peach, cy. engr.

Hamilton, O.—Plans and specifications for storm sewers on N. Second and N. Third-sts. will be on file until July 30. N. O. Brown, cy. clk.

Cleveland, O.—Plans have been prepared for sewers in Gauge, Milford, Doan and Archwood-sts. and Russell Place and Blackwell court. Walter B. Gongwen, secy.

Morristown, N. J.—This town has decided to establish a sewerage system to unite with the joint trunk sewer to be built for the Essex county townships.

Toronto, Ont.—The construction of an intercepting trunk sewer discharging directly into Lake Ontario is favored by City Engineer Rust at an estimated cost of $1,750,000.

Salina, Kas.—Estimates and grades for the proposed extension of the main sewer and for building two lateral sewers, have been submitted by O. P. Hamilton, cy. engr.

Racine, Wis.—Resolutions have been adopted providing for a sewer in N. St. Clair and Twelfth-sts. and catch basins at several corners. Mayor Higgins.

Oakland, Cal.—A resolution has been passed providing for a sewer in Occidental-st., with two brick manholes and sixteen Y branches. Rod. W. Church, cy. clk.

Grove City, Pa.—An ordinance has been passed providing for lateral sewers on Railroad, Grant, Blaine, Second, First, Price and Academy-sts. S. A. Hughes, burgess.

Winnipeg, Man.—The estimated cost of the proposed sewer on Henry-ave. is $5,100; Margaretta-st., $600; Maryland-ave., $3,590; Sargent-ave., $1,940; Rachel-st., $1,935.

Mexico, Mo.—A committee composed of Messrs. Pulton, Worrell and Rebman has been appointed to obtain information relative to building a main sewer. W. K. Potts, mayor.

Greensboro, N. C.—The construction of about 1 mi. of drain and sewer extensions to accommodate two colleges and about 6,000 people is contemplated. J. M. Bandy, cy. engr.

Springfield, Mo.—Ordinances were approved, July 17, establishing sewer districts in dists. 7 and 8 of section No. 7 and enlarging sewer dist. No. 6 of section No. 4. G. W. Hackney, cy. clk.

Kankakee, Ill.—The committee on sewers recommended, July 15, the rejection of all bids for the proposed sewers, and recommended the mayor to readvertise for bids again in September.

Harrison, Ark.—G. J. Crump, Chas. M. Greene and M. C. Maggard have been appointed commissioners of the improvement district with full power to arrange for a sewerage and water works system.

Mobile, Ala.—J. N. Hazlehurst, ch. engr., has submitted a plan for the drainage of that section of the city between the river and Cedar-st., east and west, and Government to State-st., north and south.

Brookhaven, Miss.—The city clerk has been directed to have a complete survey of this city made by a competent engineer, with plans and specifications for a sewerage system, to be submitted to the board of mayor and aldermen in August.

Columbus O.—The board of public works adopted a resolution July 15, asking for a special election on the proposition to issue $2,500,000 bonds for the proposed sewage

disposal plant. A resolution to hold the election Aug. 3 was approved.

Guthrie, Ok.T.—(Special.)—F. A. White, cy. engr., says that this city sold $120,000 improvement bonds recently, the money to be expended as follows: Sewers, $65,000; water works, $30,000; city hall, $25,000.

Iowa City, Ia.—A resolution was adopted July 12 directing the city engineer to prepare plans and specifications for a sewer in Market-st. The resolution will come up for final action on Aug. 7.

The question of issuing bonds for the construction of sewerage systems will be voted on at the following places: Wilmington, N. C., Aug. 15; Mohawk, N. Y., Aug. 3; Thompsontown, Pa., Aug. 10; Westenville, O., Aug. 19; Nampa, Idaho;

Syracuse, N. Y.—Charles A. Sweet, cy. engr., estimates the cost of constructing the intercepting sewer along Onondaga creek and Harbor brook at $505,000. That does not include, however, $300,000 permanent creek improvement, which he says can go for the present.

Fitchburg, Mass.—Sewage purification by means of intermittent filtration has been recommended by Freeman C. Coffin, civ. engr. of Boston. He proposes the immediate construction of sixteen acres of beds. He estimates, however, that thirty-three acres would be required for all the present flow and about forty acres for the flow ten years hence. He also advises a small working plant to test one or more of the so-called bacterial methods of treatment and if the trial should prove satisfactory such a plant might be constructed for the balance of the sewage, or that portion not treated on the sixteen-acre tract. David A. Hartwell, cy. engr.

CONTRACTS TO BE LET.

Beloit, Wis.—Bids are asked until Aug. 2 for sewers. Edgar Greene, clk. B. P. W.

Oshkosh, Wis.—Bids are asked until 12 m. Aug. 7 for sewers in Huron-st. and Saratoga-ave.

Greenwood, Miss.—Bids are asked until Aug. 6 for building a sewerage system. R. H. Hick, mayor.

St. Paul, Minn.—Bids are asked until Aug. 5 for building sewers in three streets. C. H. Bronson, clk. B. P. W.

Akron, O.—Sealed bids are asked until 12 m. Aug. 5 for a main trunk sewer in Dist. No. 9. Chas. H. Isbell, clk.

Wabash, Ind.—Sealed bids are asked until Aug. 12 for a sewer in Wabash-st. Robt. P. Woods, cy. engr.

Binghamton, N. Y.—Sealed bids are asked until Aug. 6 for sewers in Mary-st. and Vestal-ave. I. C. Hull, cy. clk.

Huntington, Ind.—Sealed bids are asked until Aug. 3 for constructing a drain. Herman Taylor, drainage comr.

Webster City, Ia.—Sealed bids are asked until 8 p. m. Aug. 5 for a sewer in Second-st. P. M. Banks, cy. clk.

Dunkirk, N. Y.—Bids are asked until Aug. 6 for a 12-in. tile sewer in E. Front-st. J. P. Groesch, cy. clk.

Concordia, Kas.—Sealed bids are asked until 6 p. m. Aug. 5 for constructing a sewerage system. E. C. Witcher, cy. clk.

Birmingham, Ala.—Sealed bids are asked until 12 m. Aug. 7 for constructing sanitary and storm sewers. Julian Kendrick, cy. engr.

Huntington, Ind.—Sealed bids are asked until Aug. 13 for constructing sewers. Frank Guthrie, cy. engr.

Albion, Ind.—Bids are asked until Aug. 6 for a sewer from the court house and jail. Thos. A. Huston, co. audt.

New York City—Bids are asked until Aug. 7 for sewers in portions of three streets in Borough of Queens. James Kane, comr. sewers.

Union City, Ind.—Bids are asked until Aug. 5 for building a sewer in the alley between Plum and Walnut-sts. G. A. Rosenbush, clk.

Columbia, Mo.—Sealed bids are asked until 7:30 p. m. Aug. 6 for building sewers in Dist. No. 6. John S. Bickness, cy. clk.; E. E. Cauthorn, engr.

Sherman, Tex.—Bids are asked until Aug. 5 for constructing a complete sewerage system. E. M. Kearney, cy. secy.

St. Paul, Minn.—Sealed bids are asked until 2 p. m. Aug. 5 for sewers on Isabel-st. and Indiana and Snelling-aves. B. P. W.

Shreveport, La.—Sealed bids are asked until 12 p. m. Aug. 2 for 4½ miles of 8 to 18-inch sewer. W. S. Kuhn, genl. mgr., Shreveport W. W. Co.

Mason City, Ia.—Sealed bids are asked until 8 p. m. Aug. 5 for 12,554 feet of sub-main and lateral sewers, with manholes. F. M. Norris, mayor.

Waverly, Ia.—Sealed bids are asked until Aug. 6 for constructing an 8-inch vitrified pipe sewer in certain blocks. F. H. Munger, cy. clk.

New Rochelle, N. Y.—Bids are asked until Aug. 7 for constructing sewers and appurtenances in numerous streets, roads and avenues. Wm. J. Haskins, ch. engr.

Canton, O.—Sealed bids are asked until Aug. 12 for constructing 3,300 feet of sewer in Graham-ave. and 1,720 feet in Short-st. Philip H. Weber, cy. engr.

Havana, Cuba.—Sealed bids are asked until 12 p. m. Sept. 25 for a sewerage system. Lieut. W. J. Borden, corps of engrs., U. S. A., ch. engr., city of Havana; Miguel Gener, mayor.

South Bend, Ind.—Sealed bids are asked until 10 a. m. Aug. 6 for constructing sewer and water connections on Napier-st., from Scott to Chapin. Arthur Q. Hubbard, chmn. B. P. W.

Galion, O.—Sealed bids are asked until 12 m. Aug. 3 for furnishing plans and specifications for a sewage disposal or sanitary plant for this city. J. O. Ross, cy. clk.

Boston, Mass.—Bids are asked until Aug. 6 for building section 30 of the Neponset Valley sewer in West Roxbury, Norton and Brookshire. Wm. Davenport, secy. Met. water and sewerage bd.

Sparta, Wis.—Bids are asked until 2 p. m. Aug. 5 for 500 feet of 24-inch sewer and 2,262 feet of 6-inch sewer, with 6 manholes, on Main-st. Z. K. Gerrett, chmn. sewer com.

Wapakoneta, O.—Sealed bids are asked until 12 m. Aug. 2 for constructing 1,172 feet of 24-inch sewer in Water-st., including manholes, etc. Chas. E. Fisher, vil. clk.; Samuel Craig, engr.

Davenport, Ia.—Sealed bids are asked until 2 p. m. Aug. 6 for a sewer on Seventh-

st., Tremont-ave., Oak-lane, Walling-court, High-st., Carey-ave. and Park-court. Thomas Murray, cy. engr.

Sheboygan, Wis.—Sealed bids are asked until Aug. 5 for 492 lin. feet of 48-inch iron pipe; 1,700 lin. feet 48-inch brick sewer; 1,640 lin. feet 10 and 15-inch pipe sewer; 17 manholes. C. U. Boley, chmn. B. P. W.

Mansfield, O.—Sealed bids are asked until 12 m Aug. 5 for an 8-in. main sewer in Marion-ave. Bids will be received until 12 m. Aug. 10 for a 6-in. sewer in Bowman-st. F. M. Remy, cy. clk.

New Castle, Pa.—Sealed bids are asked until 7 p. m. Aug. 12 for the construction of the city of New Castle main sewer, 13,720 ft. in length, and the Big Run main sewer, 2,150 ft. long. John C. Jackson, cy. clk.

Hammond, Ind.—Sealed bids are asked until 8 a. m. Aug. 6 for constructing a main brick sewer in Hohman-st., from the Grand Calumet river to Hoffman-st., and in Hoffman-st., from Hohman-st. to Torrence-ave. Peter J. Lyons, cy. engr.

CONTRACTS AWARDED.

Methuen, Mass.—Chas. G. Craib & Co. secured the contract for constructing sewers.

Merrill, Wis.—The contract for building sewers was awarded to A. B. Harding of Racine.

Port Clinton, O.—The contract for a sewer in District No. 8 was awarded to A. M. Slaymaker of this city for $3,602.

Iowa City, Ia.—John L. Berry was awarded the contract July 12 for building a sewer in N. Capital-st. for $593.

Barberton, O.—The contract for the Seventh-st. sewer was awarded July 17 to Paul M. Henry.

Hartford, Conn.—Michael O'Neil was awarded the contract for a sewer in South-st. and Franklin-ave. for $1,216.50.

Marinette, Wis.—The contract for sewers on Ludington and Stephenson-sts. was awarded to John Sanderson.

Mt. Pleasant, Mich.—The contract for a trunk sewer was awarded to Meagher & Donahue of Bay City for $9,750.

Schenectady, N. Y.—John Allen was awarded the contract July 2 for constructing sewers for $24,773.

Hillsboro, N. D.—C. H. Porritt of Fargo, N. D., was awarded the contract for building a sewer in this city.

Lake Linden, Mich.—The contract for a brick sewer was awarded to J. H. Green Sons of Appleton, Wis., for $72,000.

Sidney, O.—The contract for constructing sewers was awarded to Milton E. Bennett for $40,847, according to press reports.

Ashland, Ky.—The contract for constructing a sewer in Greenup-ave. was awarded July 15 to A. H. Savage for $766.

Swissvale, Pa.—Sewer contracts were awarded July 15 as follows: Lee & Casey, section 1; Cronin & O'Herron, sections 4 and 5.

Altoona, Pa.—J. H. Miller was awarded the contract July 19 for building the 7x9 stone sewer in the Fourth sewer district.

Davenport, Ia.—The contract for constructing a sewer in the packing house district was awarded to Daniel Keeler for $4,385.

Belfast, Me.—The contract for a new sewer on Front-st., from Miller to Commercial, has been awarded to Cottrell & Stickney for $2,832.88.

Cherokee, Ia.—The contract for a sewerage system at the new insane hospital was awarded to Kehoe & Son of Des Moines, for $2,000.

Redwood Falls, Minn.—The contract for building 10 blocks of sewers was awarded to Fraser & Elliott of Rochester, Minn., for $2,290.60.

Maquoketa, Ia.—The contract for building extensions to the sewerage system was awarded July 8, to Frank McNear for $5,291.50.

Lebanon, Ind.—The contract for building the sewerage system was awarded to George W. Seibert of Indianapolis, for $59,732.68.

Racine, Wis.—The contract for building a sewer on Twelfth-st., was awarded to Hanson & Thompson at 60 cts. a lin. ft. and $6 for lampholes.

Mt. Vernon, O.—The only bid received July 20 for constructing sewers in districts Nos. 1 and 2 was that of Stoyle & Ralston, of this city for $2,899.

Delaware, O.—The contract for building a sewerage system was awarded, July 17, to E. A. Williams of Ulrick & Williams, Springfield, O., for $74,000.

Grand Forks, N. D.—The contract for a sewer and plumbing for the East Side Central school building was awarded July 18 to J. B. Mooney & Co.

Rock Island, Ill.—The contract for building the Twenty-first-st., sewer was awarded to the Tri-City construction company., of Davenport, Ia.

Fond du Lac, Wis.—The contract for building an intercepting sewer and purification plant was awarded, June 26, to Richard J. Bloedel, for $33,000.

Milwaukee, Wis.—The contract for building the third section of the West Side intercepting sewer was awarded to George E. Zimmerman, of this city, at $6.93 a ft.

Hartford, Conn.—The Hartford paving and construction company, was awarded the contract, July 10, for a brick sewer in Garden and Liberty-sts., for $1,749.25.

Ft. Madison, Ia.—The contract for constructing a partially new sewerage system at the penitenitary was awarded to William Harrabin, of Iowa City for $7,000.

Salem, N. J.—The contract for a sewer on Walnut-st., was awarded July 17 to Charles Righter, at 34 cts. a ft. for the main sewer and 35 cts. for the branch sewer.

Milwaukee, Wis.—Sewer contracts have been awarded as follows: Canal-st., 1,230-ft. 12 and 15-in. pipe. H. Hobensee, 86 cts. a ft., Thirteenth-ave., 321-ft. F. H. Nakelski, $1.13 a ft.

Cleveland, O.—The contract for constructing the main intercepting sewer was awarded July 16 to Clements Bros. for $176,160. The contract for a sewer in Doan Brook valley was awarded July 18 to Clements Bros. for $45,873.

Findlay, O.—McGarry & Isbell of Akron secured the contract for sewer construction in Liberty and Sandusky-sts. for $27,991. The work includes 16,829 ft. of 54 to 6-in. brick and pipe sewers, 67 catch basins, 25 manholes and 1 flush tank.

Washington, D. C.—The district commissioners have decided to accept the proposal of the Allis-Chalmers company, of Milwaukee, Wis., for the pumping machinery,

boilers and auxiliaries required to equip the sewage pumping station at $253,000.

Woodbury, N. J.—The contract for constructing the sewerage system was awarded July 17 to the American Artificial Stone Pavement company of Philadelphia for $48,825.65. The other bidders were the Hanson Const. company, Newark, N. J.; Geo. W. Ledlie, Odd Fellows' Temple, Philadelphia; A. Costa, Orange, N. J.; Wm. Easby, Jr., dept. of engineering, University of Philadelphia.

Marion, Ind.—L. C. Lillard was awarded the contract for a storm and sanitary sewer in North Marion at $1.40 a lin. ft; manholes $20, and catch basins, $14. He received the contract also for a sewer in Twenty-sixth-st., from Adams to Gallatin. Chas. Vermillion was awarded sewer contracts as follows: Laterals for Twenty-sixth-st. sewer, 78 cts. a lin. ft.; sewers in alleys, 75 cts. a lin. ft., and $22 for manholes.

Haddonfield, N. J.—Bids were received July 15 for the construction of the sewerage system and sewer disposal as follows: John Quinlan, South Amboy: Sewers proper, $24,804; sewage disposal, $5,886; total, $30,689; alternate sewage disposal, $10,619; total with alternate sewage disposal plant, $35,423. A. Costa, Orange, N. J.—1, $27,454; 2, $4,035; 3, $32,488; 4, $9,305; 5, $36,759. John H. Hurley, Trenton, N. J.—1, $27,275; 2, $6,892; 3, $34,146; 4, $9,015; 5, $36,290. Herr & Clark, Altoona, Pa.—1, $30,096; 2, $6,323; 3, $36,419; 4, $10,877; 5, $40,973. David Peoples, Philadelphia—1, $36,559; 2, $9,766; 3, $46,325. J. I. Hillpot, Bound Brook, N. J.—1, $42,226; 2, $7,430; 3, $49,656; 4, $8,379; 5, $50,605.

WATER-WORKS.

Pontiac, Ill.—The Pontiac Water Works were sold under foreclosure proceedings July 19 by Master in Chancery Carrithers to the highest bidders for $40,000.

Carbondale, Ill.—The city council has refused to accept the new water works system constructed for this city, and the matter will be carried to the courts.

Belleville, Ill.—A temporary injunction was granted July 17 by Judge Burroughs, restraining the Belleville Deep Well Water company for discontinuing its service.

Ft. Wayne, Ind.—The increased consumption of water made it necessary to turn the water from the canal into the intake basin July 23 and from there it was pumped into the city mains.

Los Angeles, Cal.—The city council passed a resolution July 11 offering the Los Angeles City Water company $2,000,000 to compromise the differences existing between the water company and the city.

Jersey City, N. J.—The water department was compelled July 23 to reduce the flow of water to prevent the depletion of the water stored in the reservoirs and maintain an adequate supply in case of fire.

St. Cloud, Minn.—The city council adopted a report of the water works committee July 1 asking for the sum of $4,000.25 for hydrant rental for the last six months. The plant is being conducted by a receiver for the second mortgage bondholders.

Uniontown, Pa.—An injunction was granted by the court July 19 restraining the Citizens' Water company of Scottdale from diverting the water from Spruce Creek, which supplies the big well of John S. Detwiler at Pennsville, who alleges his property will be ruined.

New York City—J. J. R. Croes, Elnathan Sweet and Edwin F. Smith, the engineers appointed to study the difficulties met with in the new Croton water works system, have begun their investigation, but the result will not be made known for some time.

Helena, Mont.—The Helena Water Works company filed notice of appeal July 10 from the decision of Judge Clements refusing its application for an injunction to prevent this city from paying out any money until its claim for $52,000 under the water contract has been settled.

Sioux Falls, S. D.—The water company refused to accept from the city officials the amount tendered for the amount of its bill for the quarter ending April 1, less the amount which the city claims to have been overcharged on extension of water mains. The matter will be carried to the courts.

Pittsburg, Pa.—An electrolysis damage suit has been instituted against the United Traction company by William McMahon, on account of the failure of a lead pipe supplying the Home hotel. He seeks to recover damages to cover the expense of repairs to the service pipe and extra labor employed to supply the hotel with water while the service was out of use.

Luray, Va.—Suit was instituted against the Luray water system, July 11, by E. A. Wilson of Saulsbury, N. C., for $25,000. The plaintiff has the contract for constructing the water works system, and the contention came up over the reservoir, Wilson claiming the work should be classed as solid work, while the town claims the work should be classed as loose work.

Duluth, Minn.—The case between the West Duluth Water and Light company and the city of Duluth will come up for trial in October. This is the suit in which the West Duluth company, through its receiver, R. R. Dunn of St. Paul, is endeavoring to force the city to carry out the terms of a contract made with the old Duluth Gas and Water company in regard to rates for furnishing water.

St. Charles, Mo.—Suit was filed July 16 by the Water and Improvement company of this city against the Mississippi Valley Trust company, the William C. Little & Bro. Investment company, the city of St. Charles and Henry E. Vogelsmeier asking that the courts declare null and void 100 water works bonds of the city of St. Charles, now owned by the trust company and the investment company.

Topeka, Kas.—The city council has decided to proceed against the water works company under the method for acquiring the plant provided in the original franchise granted by ordinance in 1881. This gives the city until about July, 1902, to begin proceedings to acquire the plant. A petition will be filed in the district court asking the court to fix the value of the plant and the terms of sale.

Omaha, Neb.—Judge Minger, in the U. S. Circuit Court, filed an opinion July 26 in the case of John W. Edmiriston against the city of Beatrice, rendering judgment against the defendant for an amount of money due on two sets of water works

bonds, the amount of which is not yet determined. The point involved was the liability of a city to issue bonds in excess of statutory provision and the fact that the bonds must recite the act under which they are issued.

Chicago, Ill.—In a communication to the drainage board, July 8, A. R. Reynolds, commissioner of health, objected to the use of the area between Twenty-third and Thirty-ninth-sts., on the lake shore, as a dumping place for material dredged from the Chicago river. He says that the dumping polluted the water supply of the South Side. He suggests as a solution of the problem that samples of the lake bottom be sent to the city laboratory for analysis, so that the least harmful area for dumping may be ascertained.

Ft. Scott, Kas.—A committee was appointed July 24 to notify the water company that if it does not take immediate steps to purify its service the city will refuse to pay hydrant rentals. The Ft. Scott Water company has a franchise to furnish the city water out of the Marmaton river. Just above the company's pump house farmers give their stock access to the water, thus polluting the water. The company insists that if the city wants good water it will have to buy the privileges from the farmers, while the city insists that the water company's obligations require it to purchase the privileges.

Cedar Rapids, Ia.—Judge Wm. G. Thompson granted the application of the Cedar Rapids Water company, July 15, for a temporary injunction restraining the city of Cedar Rapids from taking water from the fire hydrants for street sprinkling and from taking water for use in the city hall, police and fire stations. The case will come up for final hearing Aug. 26. Judge Thompson held that the company is entitled to compensation for water furnished and that it cannot be charged anything for the privilege of occupying the streets and alleys of the city; that the compensation proper in each case is a question of evidence, which will be presented on final hearing.

CONTEMPLATED WORK.

St. Joseph, La.—This town voted July 17 to issue $5,000 water works extension.

Highland Park, Mich.—The extension of the water mains is proposed.

Galion, O.—The question of extending the water mains is being considered.

Columbus, O.—The installation of a uniform water meter system is contemplated.

Marietta, O.—Water works extensions and improvements are contemplated at a cost of $100,000.

Huntington, W. Va.—A new company has been formed to establish another system of water works.

Oneida, N. Y.—A resolution is pending which provides for the adoption of water meters.

Englishtown, N. J.—Plans for a water works system are being prepared and bids will be asked soon.

Canon City, Col.—The water superintendent has been instructed to put in six more filters.

Monrovia, Cal.—The water commissioners are urging the board of trustees to install a meter system.

Cleveland, O.—This city contemplates asking for bids soon for water meters. Supt. Kingsley of W. W. dept.

Marshall, Mo.—The city council will submit the question of the proposed new water works system to the people.

Battle Creek, Mich.—A resolution has been passed providing for the construction of a water main on Gonfield-ave.

Collinsville, Ill.—The city council has voted to issue $30,000 water certificates for a new base of water supply.

East Hancock, Mich.—The residents of the Quincy addition are agitating the question of a water supply.

Morton, Minn.—(Special.)—Water works system plans on file with Geo. Welch, prest. com.; G. L. Parkhill, engr., Redwood Falls, Minn.

Greenville, N. C.—Plans and specifications for a water works system are being prepared by J. L. Ludlow of Winston, N. C.

East Orange, N. J.—The city clerk has been instructed to advertise for bids for 2,500,000 gals. of pure water per day.

Brinkley, Ark.—The water works committee has been authorized to borrow $5,000 for the purpose of improving the water works plant.

Green Island, N. Y.—The fire and water committee was directed July 22 to secure information relative to water works construction.

Peoria, Ill.—The construction of an additional water main between the plant of the Peoria water company and the city is contemplated. Mayor Bryan.

Harrison, Ark.—G. J. Crump, Charles M. Greene and B. C. Maggard have been appointed commissioners with full power to arrange for a water works system.

Mason City, Ia.—A resolution has been adopted authorizing the mayor to employ a competent engineer to investigate the water works system and other needed improvements.

St. Joseph, Mo.—Ordinances were passed July 22 providing for the laying of water mains in Garfield and Linwood-aves., Seymour-st., King Hill-ave. and Vine-st.

Crestone, Colo.—The city council is considering a proposition made by Gen. Irving Hale of Denver for a water works and electric light franchise.

Des Moines, Ia.—The city council has adopted the report of the water committee ordering the water company to lay 11,600 ft. of water mains this season.

Dowagiac, Mich.—(Special) J. S. Haines, cy. surv., says this city will put in new pumps, enlarge the pumping station and extend the water mains.

Guthrie, Ok.—(Special) T. A. White, cy. engr., says that $30,000 bonds have been sold and the money will be expended for water works.

Redlands, Cal.—The date of the bond election for the purchase of a municipal water supply, which was to have been held Sept. 10, has been postponed.

Pierce, Neb.—(Special.)—Arnold C. Koenig, cy. engr. of Grand Island, has been engaged to prepare plans and specifications for a water works system. L. R. Hertert, clk.

Laurel, Neb.—(Special)—Plans for a water works system are being made by Arnold C.

Koenig, C. E., of Grand Island, Neb. The question of issuing bonds will be voted on Aug. 6.

Ft. Wayne, Ind.—A committee, composed of fifty citizens, has been appoined by Mayor Berghoff to co-operate in a permanent and satisfactory solution of the water supply question.

Wellsville, O.—Emil Kuichling of Rochester, N. Y., and L. E. Chapin, Canton, O., engrs., have reported in favor of Little Yellow creek as a source of water supply for this city.

Bloomfield, Neb.—(Special)—The question of issuing bonds for water works extensions will be voted on. W. D. Frank, clk.; Arnold C. Koenig, engr., Grand Island, Neb.

Bath, N. Y.—A municipal water works system is proposed and a committee has been appointed to investigate whether or not the company's plant could be duplicated for $46,291.55.

Hinsdale, Mass.—The committee appointed to investigate the subject of securing a water supply has been instructed to make still further investigation and report at the annual town meeting in March.

Kansas City, Mo.—The board of public works has recommended the construction of a 14-inch main on Sixteenth-st., a 10-inch main on Broadway and Twelfth-sts., and an 8-inch main on Grand-ave.

Redwood Falls, Minn.—(Special)—Bids are being asked for a steel water tower 85 feet high and of 100,000 gallons capacity; also for 50 water meters. Plans on file with cy. clk. G. L. Parkhill, supt. water and sewer dept.

The question of issuing bonds for the construction of water works will be voted on as follows: Laurel, Neb., Aug. 6; Merrillan, Wis., Aug. 6; Neligh, Neb.; Hopkins, Minn., Aug. 6; Plymouth, O., Aug. 8; Webster, S. D.; Bedford, Ia., Newark, O.

Lebanon, Pa.—Owing to errors in its method of awarding the contract for building the Poplar run extension of Hammer creek water supply this city will be compelled to readvertise for bids. J. D. Kerr, secy. water bd.

The question of issuing water works bonds has been favorably voted on at the following places; Paulding, O.; Loudonville, O.; Bricelyn, Minn.; Weatherford, Ok.; Mantua, O.; Saranac Lake, N. Y.; Manistee, Mich.; Pontiac, Mich.; Lansing, Ia.

Ft. Worth, Tex.—The city council decided July 12 to advertise for bids for water meters. The proposition of Daniel W. Mead of Chicago to secure a supply of artesian water, under a guarantee of 2,500,000 gal. supply for $100,000 and a 3,000,000 gal. supply for $110,00 is being considered. John B. Hawley, cy. engr.

San Francisco, Cal.—Estimates for a new water supply have been made by C. E. Grunsky, cy. engr. The estimates range from $16,200,000 for a single 48-inch pipe line of 30,000,000 gals. from the Stanislaus and Tuolumne rivers, to $34,178,000 for a double 56.11-inch pipe line with a combined daily capacity of 60,000,000 gals., drawing water from the North Yuba river.

The construction of water works systems is contemplated at the following places: Oronogo, Mo.; Malvern, Ark.; Marseilles, Ill.; Winthrop, Minn.; Evansville, Wis.; Windfall, Ind.; Vinita, Ok.; Chester, Ill.; Corunna, Mich.; Jonesboro, Ark.; Monterey, Mex.; Buckhannon. W. Va.; Shinnstown, W. Va.; Seneca Falls, N. Y.; Tryon, N. C.; Breese, Ill.; Ayrshire, Ia.; Ruthven, Ia.; Mallard, Ia.; Arcadia, Neb.; Fayette, Mo.; Whitney, Ore.

CONTRACTS TO BE LET.

Greenwood, Miss.—Bids are asked until Aug. 16 for constructing water works. R. H. Hicks. mayor.

Bakersfield, Cal.—Bids are asked until Aug. 5 for furnishing fourteen fire hydrants. A. T. Lightner, cy. clk.

Brookings, S. D.—Sealed bids are asked until 3 p. m. Aug. 7 for building a water works system. G. A. Mathews, mayor; I. V. Walker, cy. clk.

Waterbury, Conn.—Sealed bids are asked until 8 p. m. Aug. 13 for stripping portions of the basin of the Wigwam reservoir. R. A. Cairnes, cy. engr.

Knox, Ind.—Contracts will be let about Aug. 15 for furnishing thirty hydrants, four mls. of pipe and a standpipe. J. A. Gardner is interested.

Fort Greble, R. I.—Bids are asked until Aug. 8 for constructing a pump house, a pumping system, etc. H. P. Young, U. S. A., Newport, R. I.

Yonkers, N. Y.—Bids are asked until Aug. 3 for 300 lengths of 12-in. pipe. A. W. Kingsbury, clk. bd. water com'rs.

Park River, N. D.—Sealed bids are asked until Aug. 12 for a water works system. O. E. Lofthus, cy. audt.

Newark, N. J.—Sealed bids are asked until 3:30 p. m. Aug. 8 for constructing a storage reservoir at Cedar Grove. Morris R. Sherrerd, engr. and supt. water dept.

Saugerties, N. Y.—Bids are asked until Aug. 7 for constructing a dam and reservoir. H. C. Bogardus, secy. bd. water com'rs.

Ogden, Ia.—Bids are asked until Aug. 6 for constructing 2,000 ft. of water mains. F. J. Mullen, secy.

Jacksonville, Ill.—Sealed bids are asked until Aug. 2 for 5,280 ft. of 6-in. c. i water pipe, with specials and hydrants.

Binghamton, N. Y.—Bids are asked until Aug. 7 for erecting a building over the filter plant adjoining the pumping station. John Anderson, secy. bd. water com'rs.

Centralia, Ill.—Sealed bids are asked until 7:30 p. m., Aug. 6, for constructing an earth dam with a wooden core for reservoir. Wm. Hahn, water com'r.

Reading, Pa.—Sealed bids are asked until 7:30 p. m., Aug. 6, for erecting a 3,500,000-gal. filter plant of a design to be submitted by the bidder. Geo. H. Felix, prest. bd. water com'rs.

Port Arthur, Ont.—Bids are asked until Aug. 5 for constructing a timber dam on Current river and for 1,900 ft. of wood stave pipe and certain concrete work in the vicinity of the present electric power house. J. M. Neelin, chm. water power com.

Barrackpore, Calcutta, India.—Bids will be received by the commissioners of the corporation of Calcutta water works department until Sept. 2 for the erection of a pumping plant at the Pulta pumping station, near this city, consisting of two pumping engines and four steam boilers. Fred Gainsford, secy. corporation.

CONTRACTS AWARDED.

Benson, Minn.—The contract for extending the water mains was awarded to J. P. Murphy for $2,813.

St. Charles, Mo.—The contract for a water works system was awarded to Charles A. Stookey, Belleville, Ill.

Moline, Ill.—Plambeck & Burglund secured the contract for water and sewer mains in Fifth-ave., from Twenty-fourth to Twenty-seventh, for $2,035.

St. Paul, Minn.—The contract for installing a water system on the Jackson-st. market was awarded to Carl P. Dahlby, for $2,040.

Salida, Col.—The contract for enlarging the water works system by building a new reservoir was awarded July 15, to John L. Terrell, for $3,350.

Slingerlands, N. Y.—The contract for building water works was awarded to J. Warren Lamb, of Cooperstown, N. Y. for $30,000.

Hyattsville, Md.—The contract for constructing a water works system was awarded July 12, to Rosser & Castoe, of Bellaire, O., for $8,755.50.

Mt. Carroll, Ill.—The contract for a new water works tower was awarded to the U. S. wind engine and pump company, of Batavia, Ill., for $3,875.

Cincinnati, O.—The contract for the engines for the Western pumping station was warded to the Holly Mfg. company of Lockport, N. Y., for $813,400.

Voorheesville, N. Y.—The contract for laying 5 mis. of water pipe was awarded to Hildreth, O'Dea & Co. of Cohoes for $5,800.

Gloucester, Mass.—Jas. Smith secured the contract for laying water mains on Kohler, Chambers and St Marys-sts., for $1,654.45.

Ft. Wayne, Ind.—The bids for engines and air compressors was rejected and new bids will be advertised for as soon as plans and specifications can be prepared.

Ft. Worth, Tex.—The bid of the Neptune meter company, for furnishing meters for $27,012.25 has been recommended for acceptance. The bids were received Sept. 7, 1906.

Lynn, Mass.—The contract for raising the Walden Pond dam 20 ft. above its present altitude was awarded July 22 to Frederick E. Shaw of Providence, R. I., for $306,845.

BRIDGES.

Battle Creek, Mich.—This city voted to issue $10,000 bonds for bridges.

Monticello, Ill.—A 26-ft. span steel bridge east of the Monticello bridge is proposed.

Winchester, Ind.—Bids are asked until Aug. 5 for the stonework for two bridges. Co. audt.

Meadville, Miss.—Bridge bonds in the sum of $32,000 are to be issued for building four bridges.

Cleveland, O.—Sealed bids are asked until Aug. 14 for a bridge across the Cuyahoga river. J. C. Dorn, clk. co. comrs.

Austin, Minn.—Bids are desired for building a steel bridge at Water-st. to replace the present structure.

Mt. Pleasant, Tenn.—Bids will be asked soon for a pony-truss steel bridge over Sugar creek. Granbery Jackson, engr.

Woodstock, Va.—The county court has appropriated $5,000 for a steel bridge across the Shenandoah river, near Mt. Jackson.

Terre Haute, Ind.—Bids will be received until Aug. 9 for building a wagon bridge over the Wabash river. Co. comrs.

San Jose, Cal.—Bids are asked until Aug. 6 for a steel or stone bridge on Saratoga turnpike. Henry A. Pfister, clk. co. bd. supvs.

Durand, Wis.—The construction of a steel bridge across the Chippewa river to replace the present structure, at a cost of $28,000, is contemplated.

Connersville, Ind.—Bids are asked until Aug. 5 for building three steel county bridges. H. M. Broaddus, co. adut.

Tacoma, Wash.—An ordinance has been passed appropriating $4,000 for a bridge across the Puyallup river, on the tide flats.

Carrollton, Mo.—The contract for building four bridges will be let Aug. 6, according to press reports. Silas Ballard, co. comr.

White Sulphur Springs, Mont.—Bids are asked until Sept. 3 for a highway bridge across Smith river. Geo. W. Harden, clk. co. comrs.

Sherbrooke, Que.—Bids are to be asked at once for a steel bridge to replace the present Wolf-st. structure. Cy. engr.

Colorado Springs, Colo.—A steel bridge will be constructed across Clear Creek, at Miner-st., as soon as plans and specifications can be prepared.

Mankato, Minn.—Sealed bids are asked until Sept. 2 for building a steel T-beam bridge over Bull Run creek in the town of Medo. Ed. Weaver, co. audt.

Greensburg, Ind.—Sealed bids are asked until Aug. 5 for constructing a stone arch bridge across Salt creek, on Newpoint and Clarksburg road. Coleman T. Pleak, co. audt.

Valentine, Neb.—Sealed bids, with plans and specifications, will be received until Aug. 15 for building all bridges, substructure and superstructure, that may be ordered during the year.

Absecon, N. J.—Bids are asked until Aug. 14 for taking out the iron bridge at Absecon, putting in tide gates and filling in road to grade. M. L. Jackson, chmn. br. com. Hammonton.

Three Rivers, Mich.—The street and bridge committee has been authorized to procure plans and specifications from a competent engineer for a cement arch bridge across Portage river, Third-ave

Binghamton, N. Y.—(Special.)—H. Ward says that plans have been orderd for a steel highway bridge across the Susquehanna river at Exchange-st. The bridge will be 50 feet wide and 500 feet long.

Zanesville, O.—Bids are asked until Aug. 13 for constructing the superstructure of a draw span at the easterly end of the new "Y" bridge over the lateral canal of Muskingum river. Jas. L. Starkey, co. audt.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Monrovia, Cal.—An effort will be made to have the streets of this city sprinkled with oil. Capt. Banning, road overseer.

Lowell, Mass.—The street committee voted July 16 to recommend $2,500 for the purchase of an electric car sprinkler.

Dubuque, Ia.—The contract for street sprinkling for the balance of the year has been awarded as follows: District No. 1, M. Clancy, $9 a day; districts 2, 3, 4 and 5, Beeken Bros., $40 per day. The city will furnish the water.

Meadville, Pa.—Bids were received July 17 for constructing a garbage crematory plant as follows: Davis Garbage Furnace company, Lancaster, Pa., four propositions, $7,600 to $4,800, and building $4,200; Dixon Garbage Crematory company, Toledo, O., $5,106, no building; Bridgeport Boiler Works company, $7,400, building $2,500 or $5,000, with steel instead of brick stack, deduct $800.

PARKS.

Birmingham, Ala.—The purchase of 30 park seats, at $3 each has been authorized.

Buffalo, N. Y.—The park commissioners are considering plans for a dam to be constructed at the westerly end of Delaware park lake.

STREET LIGHTING.

Athens, Tenn.—The East Tennessee Light and Power company is in the hands of a receiver.

Marion, Wis.—A stock company has been formed for establishing an electric light plant.

McKeesport, Pa.—An electric light plant will be built at a cost of $50,000. J. B. Wampler.

Milwaukee, Wis.—New bids will be asked for by the board of public works for naptha lighting.

Bowling Green, O.—An electric light franchise has been granted the Bowling Green Electric Light and Power company.

Greenville, N. C.—Plans and specifications for an electric light plant have been made by J. L. Ludlow of Winston.

Dunkirk, N. Y.—A franchise to furnish heat and power has been granted to A. W. Cummings, according to press reports.

Doylestown, Pa.—Bids are asked until Aug. 12 for constructing an electric light plant. Chas. F. Sturtevant, engr., Chicago.

Park River, N. D.—Sealed bids are asked until Aug. 12 for constructing an electric light plant. O. E. Lofthus, cy. audt.

Ft. Hunt, Va.—Sealed bids are asked until Aug. 9 for an electric light and power plant. Lieut.-Col. Chas. G. Allen, Washington, D. C.

Terre Haute, Ind.—Bids are asked until Aug. 10 for a 100-H. P. boiler, 2 dynamos, 2 engines, etc., for the State Normal School. Bd. of trustees.

Darton, Ky.—Sealed bids are asked until Aug. 19 for an exclusive gas franchise for lighting, heating, fuel and power purposes. C. B. Hayward, cy. clk.

Emporia, Kas.—A special election may be called in September or October to vote on the issue of $20,000 bonds to enlarge the city electric plant.

Sturgeon Bay, Wis.—A franchise has been granted W. H. Wheeler, of Beloite, for an electric light and heating system. The plant is to cost $84,000.

Brookings, S. D.—Sealed bids are asked until Aug. 7 for the extension of the electric light system. G. A. Mathers, mayor; I. V. Walker, cy. clk.

Binghamton, N. Y.—The resolution awarding the lighting contract to Sands, Buckley & Kane will be rescinded, according to press reports, and new bids asked.

San Francisco, Cal.—Engineer Carey has been authorized to prepare plans and specifications for the establishment of an electric light plant to cost $30,000.

Litchfield, Ill.—A 10-yr. contract and franchise has been granted to the Litchfield Electric Light and Power company at $69 each a year for 2,000 c. p. open arc lights.

Chillicothe, Ill.—Sealed bids are asked until Aug. 15 for lighting the city by electricity or otherwise for two or more years from Oct. 1, 1901. D. E. Kinsella, cy. clk.

The question of issuing electric light bonds has been favorably voted on at the following places: Manistee, Mich.; Iuka, Miss.; Humboldt, Tenn.; Will's Point, Tex.; Mansfield, Mass.

Mineola, N. Y.—A committee composed of Town Clerk Wood and Justice Oakley has been appointed to advertise for bids for furnishing 50 or more incandescent street lights of 30 c. p. each.

Cleveland, O.—A resolution has been adopted authorizing Direector Salen to ask for bids for furnishing 5,000 incandescent gas lamps, the same to become the property of the city at the end of one year.

The construction of electric light plants is contemplated at the following places: New London, Wis.; Haywards, Cal.; Ada, I. T.; Adel, Ga.; Caledonia, Minn.; Washington, Ia.; Morrow, O.; Union, Ia.; Windfall, Ind.; Scottsburg, Ky.; Olin, Ia.

Cincinnati, O.—Only one bid was received July 19 for lighting the streets and alleys of this city. It was submitted by the Cincinnati Gas and Electric company, and was $72 per lamp per year for the underground district, and $60 per light per year for the overhead district.

Wilmington, Del.—A contract for the public lighting of the streets of this city has been awarded to the Welsbach Street Lighting company at $30 per lamp for one year; three years, $29; five years, $27. The length of the term of the contract has not yet been agreed upon, although it is believed that it will be a five-year term.

Bucyrus, O.—The franchise of the present company furnishing gas for this city is about to expire. The rates are high and it is believed a new company would find a good field. There is also an opening for an incandescent plant, separate or in connection with the gas plant. Prest. bd. of trade, or E. P. Donnewirth can give information.

Red Wing, Minn.—The contract for illuminating this city for five years was awarded July 19 to the Red Wing Gas and Electric company and the American Development company of Chicago at $88 per light per year for twenty 1,200 c. p. enclosed arc lights; $66 per lamp per year, for twenty enclosed arc lights; $15 per lamp per year for eighty-two 16 c. p. incandescent lamps.

A FEW WORDS FROM PRACTICAL USERS OF CEMENT

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WHAT CONTRACTORS SAY

CHICAGO, ILL., June 4, 1901.

Will be of great value and assistance to those interested in the use of this material.

STAMSEN & BLOME,
Pioneers in Cement Paving and Concrete Construction.

CINCINNATI, O., June 1, 1901.

We have no doubt it will prove very useful to us. It is handsomely gotten up and is very concise, and contains valuable information that no doubt required an immense amount of labor to compile.

S. J. OSBORN, JR., & CO.,
Contractors.

LOUISVILLE, KY., May 30, 1901.

It contains lots of valuable information not gathered between covers heretofore.

J. B. OLIGSCHLAGER,
Pres. and Treas. National Roofing & Supply Co., Cement Pavers.

INDIANAPOLIS, IND., June 10, 1901.

It is in my opinion a very useful and instructive book, and every contractor in the cement business should not fail to have one.

JULIUS KELLER,
Cement and Asphalt Paver.

BROOKLYN, N. Y.

Our opinion of your book is distinctly favorable. We have not had the time to give it the thorough examination it merits, but we have seen enough for the formation of the above opinion.

ERNEST L. RANSOME,
Concrete Specialist.

TEMPLE, TEX., June 10, 1901.

I find the Directory of American Cement Industries to be worth a week's wages of any cement worker who takes pride in his work and wishes to be up to date.

ERNST BLANKENSTEIN,
Plasterer and Contractor.

HAMILTON, O., June 3, 1901.

We are very well pleased with the Directory—just what we needed to aid us.

ISAAC COMMONS,
Kosmocrete Pavements, Cementers' Tools.

EXPRESSIONS FROM ENGINEERS

CHATTANOOGA, TENN., June 4, 1901.

Of great value to cement users.

ROBERT HOOKE, City Engineer.

DEKALB, ILL., May 31, 1901.

It appears to be just the thing needed to supply a long-felt want in this line.

W. M. HAY, City Engineer.

SAVANNA, ILL., June 8, 1901.

At this age of the American cement industries, to engineers and users of cement this book is worth its weight in gold.

J. P. PLATTENBERGER,
Street Commissioner and City Engineer.

NEW YORK, June 8, 1901.

I beg to state that I consider your Directory of American Cement Industries a very successful attempt at producing a useful and practical book upon this important subject. Its introductory is an interesting and satisfying account of the beginning and development of American Portland cement, as well as the Rosendale or natural article, and its directory features certainly ought to be very useful to those interested in the use of cement mortar, concrete and kindred adaptations of cement. I have had the book but a few days, and have already obtained information as to handlers and users which would have consumed much more time otherwise. Something may be said in favor of the husk of the cocoanut as well as the milk therein, and the result is an attractive and neat book, all considered.

CHAS. A. HAGUE,
Consulting Engineer, 39 Cortlandt St.

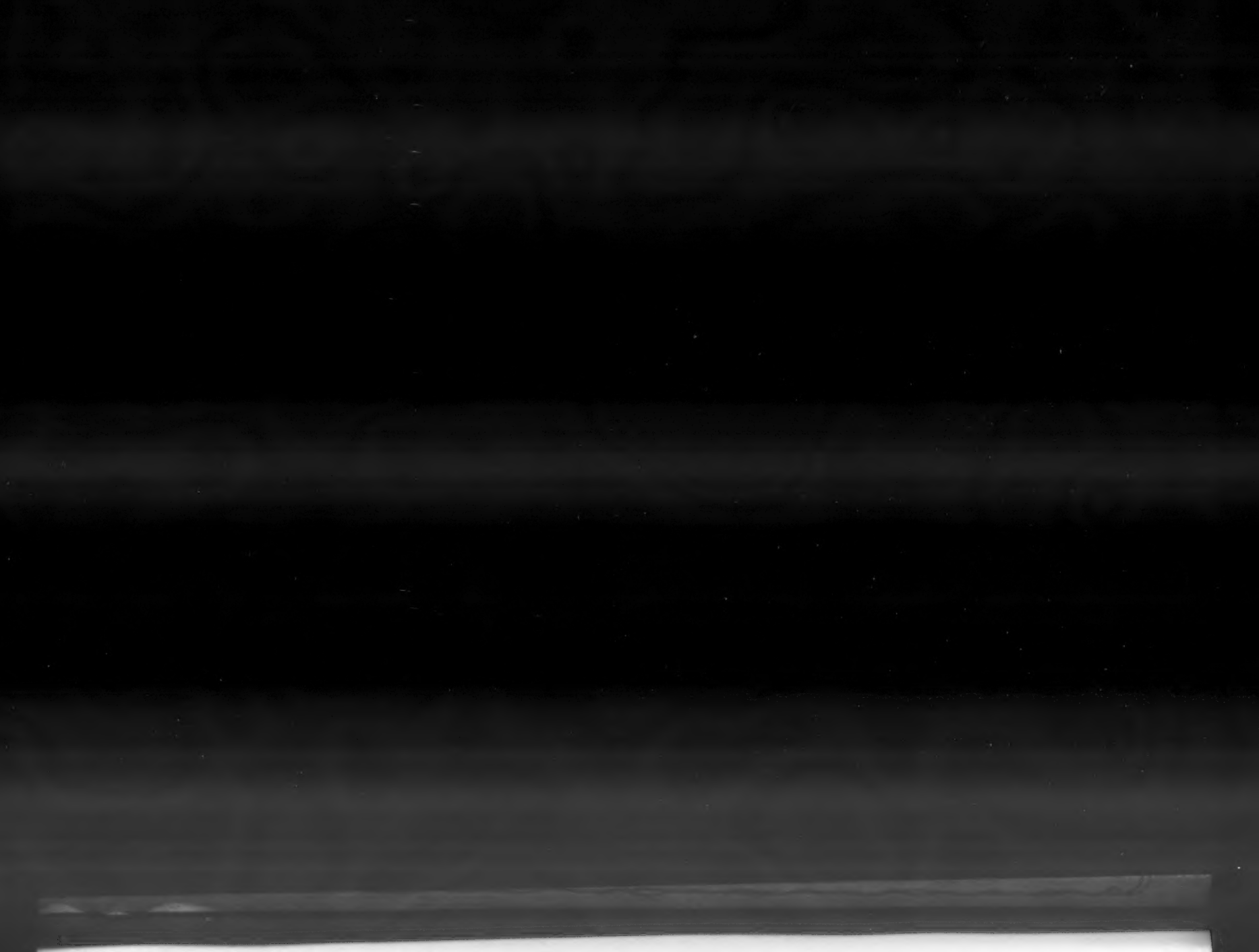
LONG ISLAND CITY, N. Y., June 12, 1901.

I find that it contains a very large and interesting collection of facts not available elsewhere, and that it is useful as a reference book as well as a directory.

CLIFFORD RICHARDSON.

PITTSBURG, PA., June 6, 1901.

I consider it to be a publication that should be in the hands of every engineer and contractor who uses cement in his constructions. The contents of the book are well arranged and thoroughly indexed, and the information is original and not to be found in any other publication. The volume of 645 pages represents a vast amount of work done in compiling all the data, and the users of cement are certainly indebted to Municipal Engineering Company for the work and expense connected with the publication of this volume.

JOHN BRUNNER,
Superintendent Department of Public Works.

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